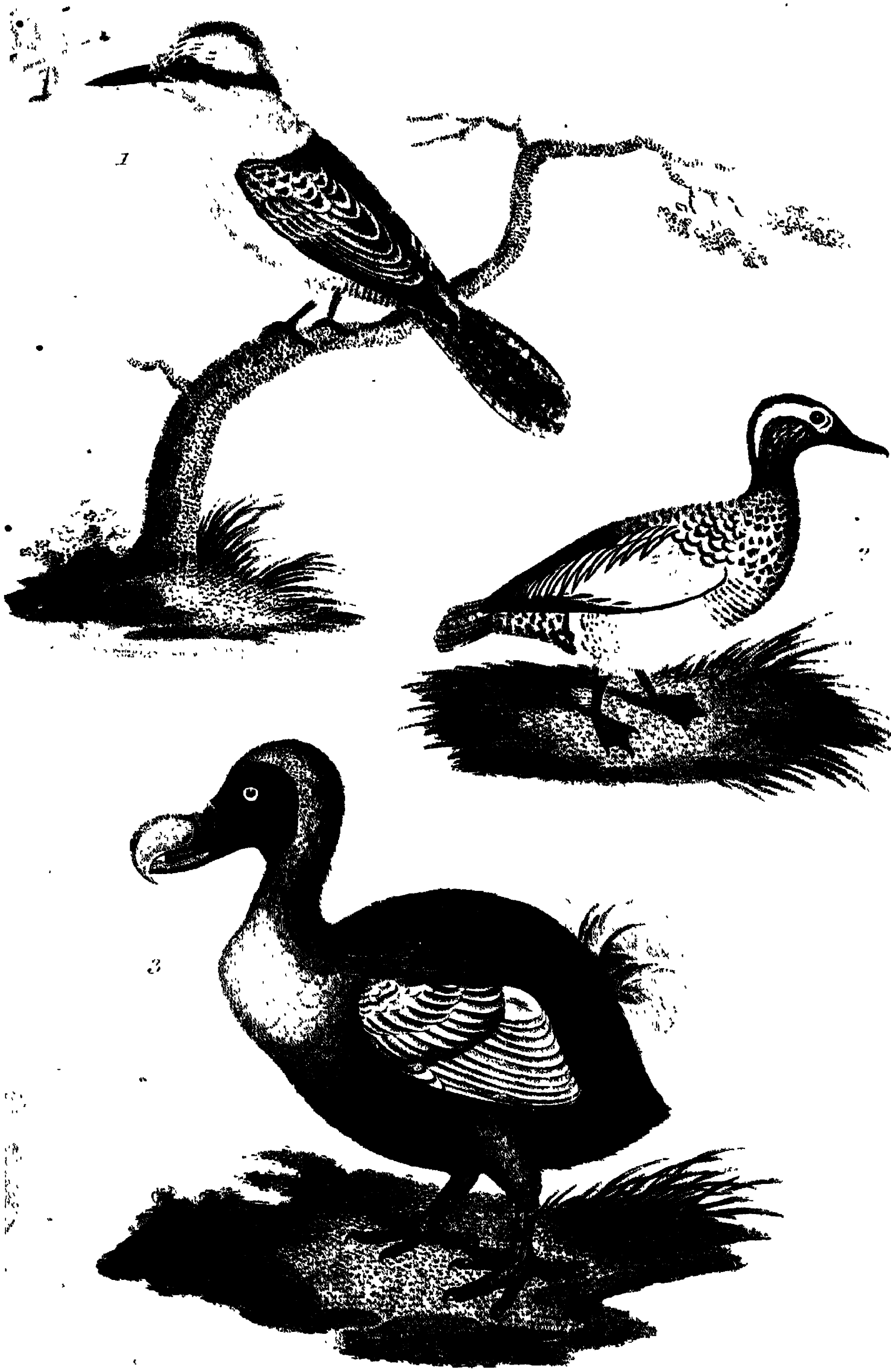
Pantalogia

VOL-5

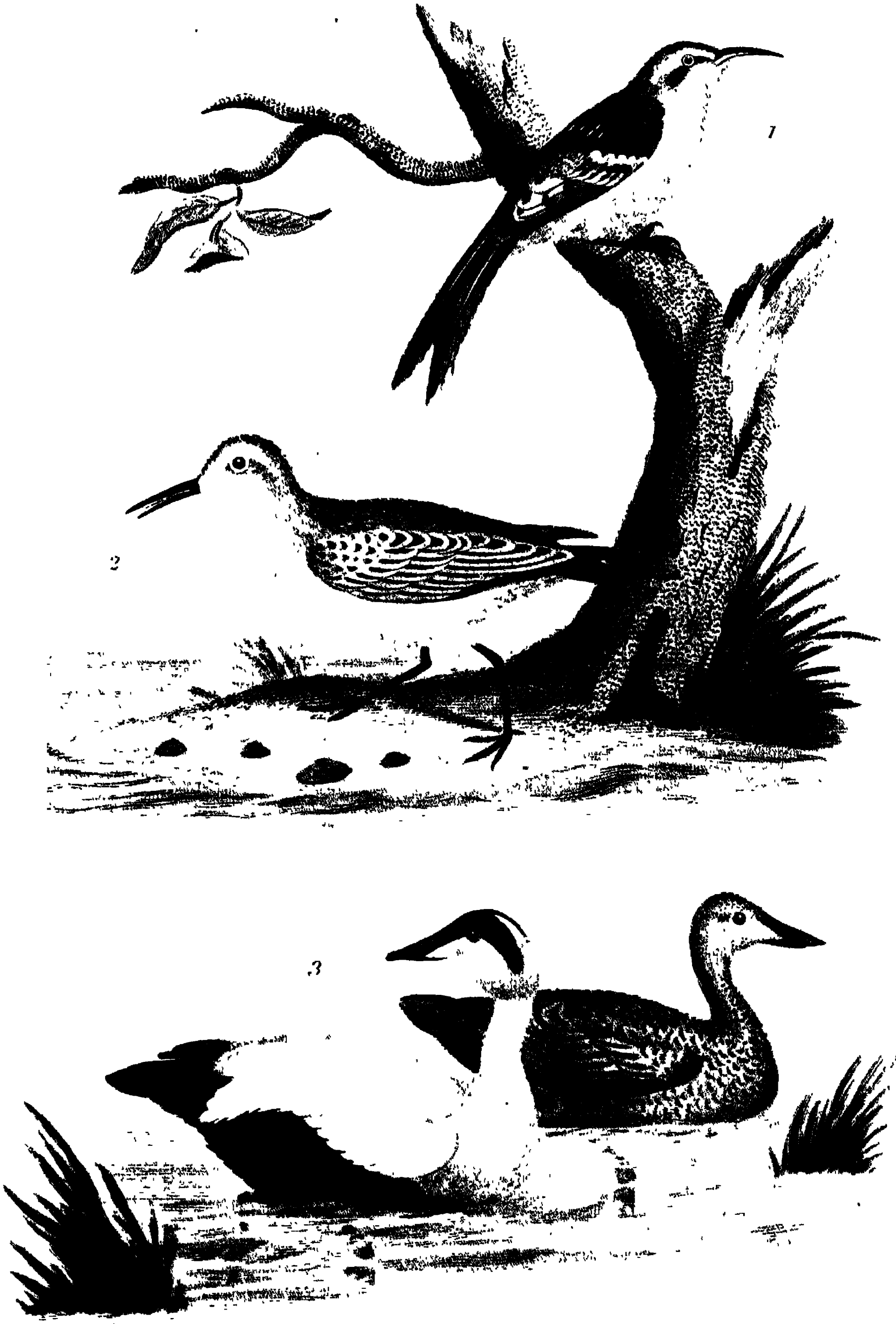


Drawn from the Life by G. Edwards.

1 Sacred King-fisher
2 Garganey Male
3 Dodo

[illegible] Waxen Chatterer

[illegible] Great Penguin.

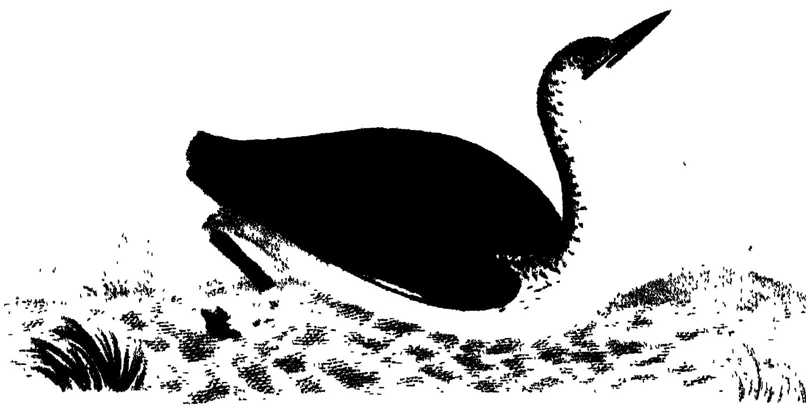


Drawn from the Life by S. Edwards

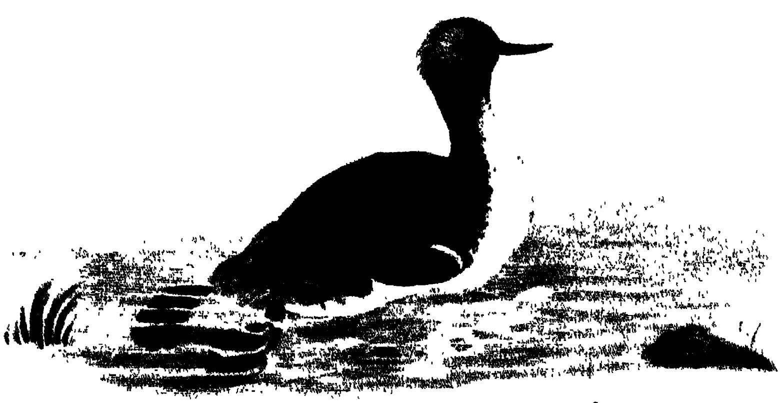
1 Creeper
2 Purre or Stint
3 Eider Duck Male & Female

London, Published by G. Kearsley, Fleet Street, March 1, 1808

Northern Diver



Imber



Eared Grebe

1 Caprimulgus Europaeus, or Common Goat Sucker
2 Coracias Garrula or Common Roller
3 Cuculus Canorus or Common Cuckoo
4 Columba Domestica Rock Pigeon

London, Published by G. Kearsley Fleet Street, ...

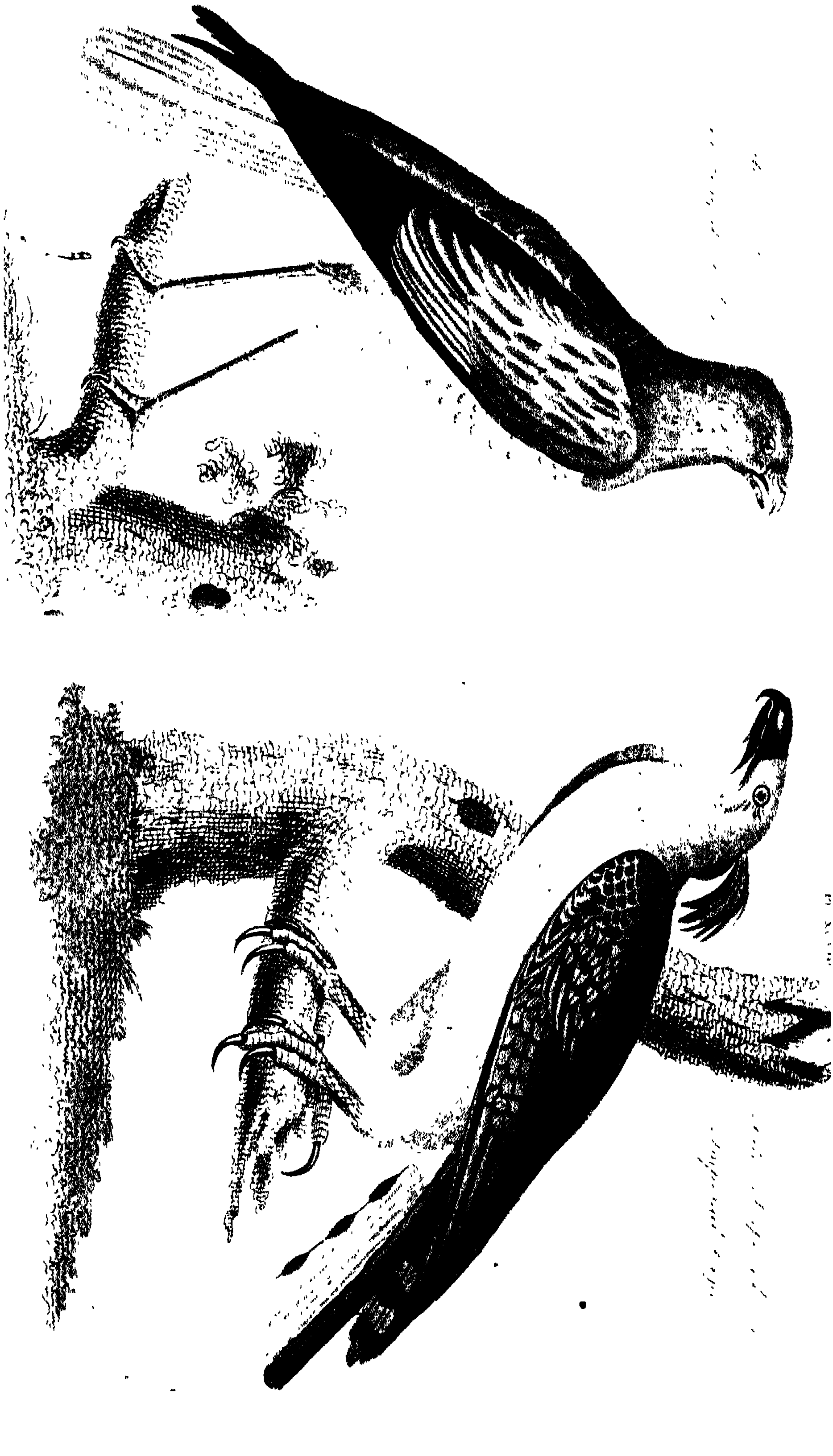
Drawn from Life by S. Edwards

1. Ardea Brasiliensis, or Brasilian Bittern.
2. Ardea Grus, or Common Crane.
3. Cancroma Cochlearia, or Crested Boatbill.
4. Ardea Major, or Common Heron.

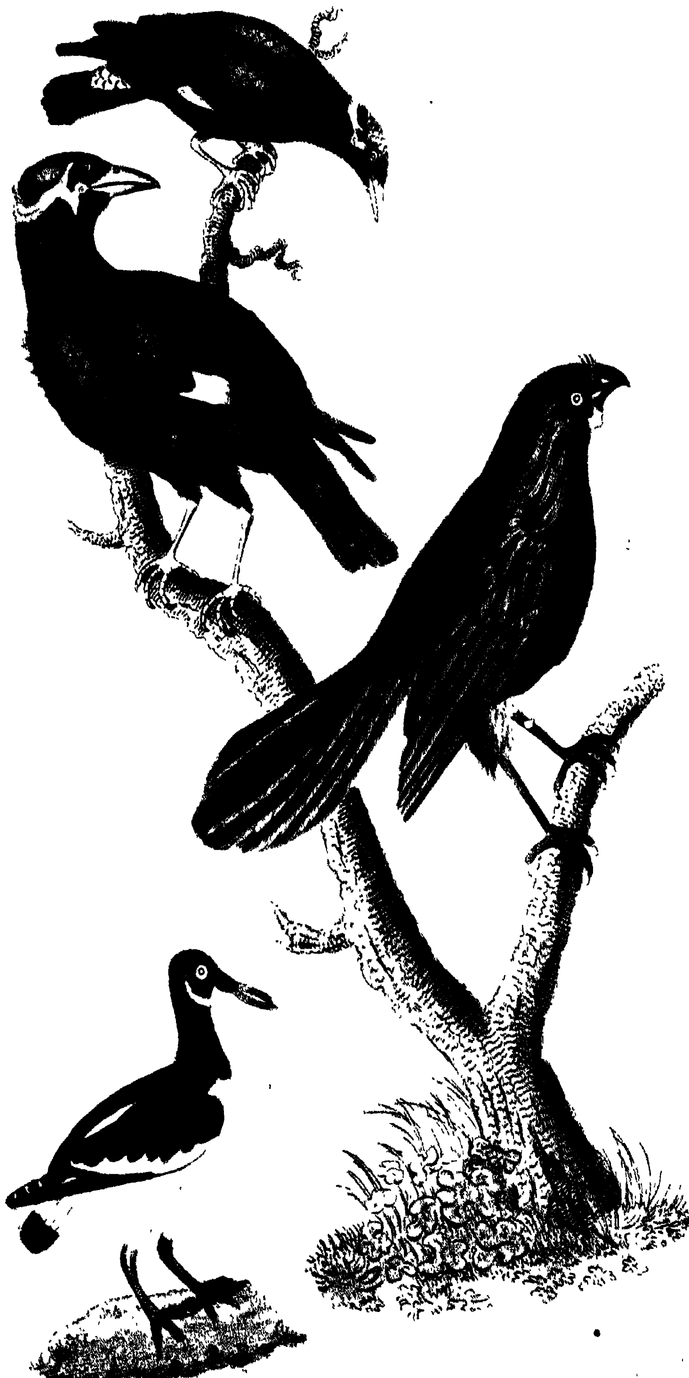
London, Published by G. Kearsley, Fleet Street, May 1808.

Falco Coronatus or Crowned Eagle

Falco Chrysaetos or Golden Eagle.



NATURAL HISTORY.



NATURAL HISTORY.

PANTOLOGIA.

FLUKES. Worms of the intestinal order, found frequently in the liver and brain of sheep, and the chief source of the rot. See FASCIOLA.

FLU'MMERY. *s.* A kind of food made by coagulation of wheat-flower or oatmeal (*Loc.*).

FLUNG. The participle and preterit of *fling*.

FLUOR, in oryctology, a genus of the class earths, order calcareous. Consisting of carbonat of lime and fluoric acid; somewhat ponderous, parasitical, never hard, shining in the dark, and crackling when heated to the degree of boiling water; not effervescing with acids; but if distilled with the mineral acids, emitting the fluoric acid gass which has the property of dissolving glass; melting before the blowpipe into a transparent glass. Six species.

1. F. pulverulentus. Sandy or earthy fluor. Earthy fluat of lime. Whitish, without lustre, powdery, with the larger particles not cohering. Found at Kabola Poiana in the district of Marmaros in Hungary, between two beds of quartz; colour light gray, greenish white, or blueish green; when strewed on an iron plate a little below redness diffusing a blue or pale yellow phosphorescent light; feels harsh and stains a little.

2. F. compactus. Solid or compact fluor. Hardish, compact, of an even texture, diaphonous, brittle, breaking into indeterminate fragments, of a common form. Found in Britain, and near Stolberg and Strasburg, whitish-grey, more or less passing into green, often spotted; fracture even or conchoidal, specific gravity from 3,120 to 3,165.

3. F. spatosus. Fluor spar. Sparry fluor. Hardish, shining, brittle, of a common form breaking into pyramidal fragments, lamellar. Another variety, with the fragments into which it spontaneously falls, resembling very minute granulations: denominated fluor mineral, or granular. Found in Britain, Norway, Sweden, Spain, and Germany, white, smoke-colour, green, violet, purple, rosy, honey-colour, or varied with spots, blotches, or veins, semi-pellucid, or transparent, breaking into three, rarely four-sided fragments, takes a fine polish, and is manufactured into various vases and figures.

4. F. tabularis. In rhombic oblong tables. Found in Switzerland, Alsace, and Saxony.

5. F. cubicus. Fluat of lime. Cubic fluor. Hardish, shining, smooth, lamellar, brittle, breaking into pyramidal fragments, cubic. Many varieties, cubes perfect; or imperfect; angles, or margins, or both truncate; margins terminating in a point, or in a three-sided pyramid. Found in Derbyshire and Northumberland, Spain, France, Saxony, Germany, &c. of the same variety of colours as F. spatosus; most frequently pellucid, rarely opake; the crystals solid or hollow, or containing a small drop of water, or some fossil, and placed in a decussate manner, laterally or irregular, or aggregate in a kidney or imperfectly globular form.

6. F. pyramidalis. Pyramidal fluor; fluor spar, fluat of lime.

α With a single pyramid, inversed, or straight, or three-sided, or truncate, or six-sided.

β With a double pyramid; the pyramids sour-sided. Found in Derbyshire, Devonshire, and Cornwall; and in various parts of Sweden, Saxony, and Bohemia: the colours vary as in F. spatosus. See FLUORIC SPAR.

FLUOR ALBUS, a morbid secretion incident

to women, commonly known by the name of *whites*. See MEDICINE, and LEUCORRHŒA.

FLUORIC ACID. See FLUORIC SPAR.

FLUORIC SPAR. (*acide fluorique*, Fr. *fluss spathsaure*, Germ.) In the Transactions of the Academy of Sciences at Berlin for 1763, is contained a memoir by Margraaf on fluor spar. This able chemist found that when the above mineral was distilled with sulphuric acid a volatile acid vapour was disengaged, which deposited a white earth on coming into contact with water: he also remarked that the retort in which the distillation was carried on was corroded and worn into holes by the process. Three years after, Scheele published a valuable essay on the same subject, in which he proved that fluor spar consisted of lime combined with a peculiar acid, many of the properties of which were investigated by him with great success. Priestley then took up the subject, confining his attention for the most part to the action of fluoric acid in the state of gas. Since the date of these last experiments but few additions have been made to our knowledge of this acid and its various combinations.

The distinguishing property of fluoric acid is that when dry and in the state of gass it readily combines with silex, and still retains its elastic form: hence arises the peculiar and almost insurmountable difficulty of obtaining this substance in a state of purity.

Fluoric acid is procured from fluor spar: for this purpose a quantity of the mineral being reduced to a fine powder is to be mixed in a thick glass retort with an equal weight of concentrated sulphuric acid: upon the application of a gentle heat the sulphuric acid will combine with the calcareous base of the spar, and fluoric gass will at the same time be liberated, and may be received in the mercurial pneumatic apparatus in the usual way. If the heat applied to the retort is somewhat considerable, and the gas is rapidly produced, the retort will give way in the space of a minute or two, being eaten into holes by the action of the acid; if the process is conducted cautiously and at as low a temperature as possible, the retort may be made to last a considerable while longer. The gass thus procured, while confined over mercury, is perfectly colourless and transparent; it has a pungent suffocating odour like muriatic acid, produces immediate death to animals which are immersed in it, extinguishes the flame of a candle after having previously tinged its flame of a green colour, and changes certain vegetable blues to red. Its specific gravity is considerably greater than that of atmospheric air, but has not yet been ascertained with any accuracy. If this gas is mixed with atmospheric air, a white vapour similar to but more copious than that occasioned by the muriatic acid gass in the same circumstances is the result; this appearance is partly occasioned by the combination of the acid with the moisture of the air, but principally by the deposition of silex, which takes place at the same time. The earth is in like manner deposited if the gass is received in water, and this experiment, according to the circumstances under which the acid is disengaged, exhibits a variety of singular and interesting appearances. As soon as a bubble of gas passes from the beak of the retort into the water it is immediately diminished in size from the absorption of a portion of the acid, and the whole would be taken up if the globule did not instantly become coated with the earth deposited by that part of the acid which is absorbed, for the earthy film being interposed between the gass and the water prevents any further combination till the bubble reaches the surface of the water, where it bursts. If this is performed in a jar full of water inverted over mercury, and care is taken to prevent the gas from being mixed with atmospheric air, the whole of the gass is absorbed, and the silex, in proportion as it is deposited, diffuses itself through the liquor, which thus at length acquires a gelatinous consistence: when in this state, the greater part of the earth may be separated by putting the whole in a piece of linen and squeezing it. The acid liquor thus procured being again inverted over mercury, will absorb an additional quantity of gas, and by thus treating it three or four times successively, a strong fuming acid liquor may be obtained, consisting principally of fluoric acid and water, but still holding in solution a portion of silex, and probably also alkali, from the decomposition of the glass of the retort. If this saturated liquor is mixed with a few drops of fluat of silver, a slight precipitate of cornea takes place, and the fluoric acid is thus separated from a small portion of muriatic acid, which, when prepared in the foregoing manner, it is always found to contain. From the liquor thus purified a considerable quantity of pure fluoric acid gas may be obtained by heating it almost to ebullition in a retort, and receiving the product in mercury. This gass appears to consist merely of fluoric acid, saturated with as much water as it can hold in an elastic state, and at a moderately cool temperature seems to have no action on glass. It combines readily with water without depositing in any earth, and has an astringent acidulous taste. A candle immerged in it is extinguished without any previous change in the colour of the flame: it combines with ammoniacal gass, forming a white cloud: it dissolves camphor, and is taken up in large quantity by oil of turpentine, to which it communicates an orange colour and a pungent acid odour. If kept for some time in a bottle of soft glass it acts upon it though slightly, on which account it is a useful precaution before putting the acid in, to line the bottle with a thin coating of a mixture of oil and wax. It has been proposed by some chemists, as a method of obtaining pure liquid fluoric acid, to make use of a leaden retort and receiver; in which case the fluor spar being previously reduced to an exceedingly fine powder, is to be mixed in the retort with an equal weight of strong sulphuric acid; the application of a gentle heat, not exceeding that of

boiling water, will force into the receiver a large quantity of acid gass, where it combines to saturation with water, and thus produces liquid fluoric acid. In this process, provided the spar selected was free from quartz, there is indeed no deposition of silex, but a very notable proportion of lead is volatilized, and remains for the most part dissolved in the liquor, which, on this account, is by no means so pure as the acid produced by Dr. Priestley's method.

Fluoric acid has not yet been decomposed, its base therefore is wholly unknown, and it is only from analogy that chemists suppose it to contain oxygen. A remarkable difference between the fluoric and muriatic acid is that the latter is incapable of becoming oxygenated: it will neither unite with oxygen in the state of gas nor when digested with manganese. Fluoric acid combines with the alkalies and alkaline earths, with alumine and silex, and with the metallic oxyds; the metals in a reguline state appear to have no affinity for dry fluoric acid, but when liquid it will dissolve iron, zinc, copper, and arsenic, hydrogen being at the same time disengaged. The order of its affinities is as follows: lime, barytes, strontian, magnesia, potash, soda, ammonia, alumine, and silex.

The only use to which fluoric acid has been applied is engraving on glass. It appears from Beckman that this was first practised by an artist of Nuremberg, in the year 1670, who prepared his etching liquor by digesting together nitrous acid and finely powdered fluor spar for several hours on a warm sand bath, and then using the clear liquor as aquafortis is employed by the copper-plate engravers. But the knowlege and application of this liquor was confined to a few German artists, till, after the discoveries of Scheele and Priestley, the fluoric acid in a pure state was used for the same purpose by various ingenious artists in England and France. Puymaurin found the liquid acid prepared in leaden vessels according to Scheele's process to anwer very well for this purpose in warm weather, but by cold its activity is so much impaired as to produce little effect even in three or four days. The gasseous acid however is much more efficacious; and being at the same time sufficiently manageable with proper care, merits the preference. To engrave on glass, select a piece of plate glass of the requisite size, cover it with hard engraver's wax, and with a needle or other suitable instrument trace the intended design as in common etching, observing that every stroke passes quite through the wax to the surface of the glass; which may be ascertained by placing the plate on a sloping frame like a portable reading desk, in which situation the light will shine through wherever the wax is removed. When the etching is completed, lay the plate with the engraved side downwards on a frame, in a box lined with strong sheet lead or thick tin foil, and place on the bottom of the box a few leaden cups containing a mixture of one part of very fine pulverized fluor spar and two parts of sulphuric acid: then close the lid of the box, and place it on a stove, or in any other convenient situation where it may be exposed to as high a heat as it can bear without risking the melting of the wax: fluoric acid gass will be copiously disengaged, and in a short time (from one hour to three, according to circumstances) the plate will be found sufficiently corroded. See FLUOR.

FLU'RRY. *s.* 1. A gust of wind; a hasty blast (*Swift*). 2. Hurry; a violent commotion.

To FLUSH. *v. n.* (*fluysen*, Dutch.) 1. To flow with violence (*Mortimer*). 2. To come in haste (*Ben Jonson*). 3. To glow in the skin (*Collier*). 4. To shine suddenly: obsolete (*Spenser*).

To FLUSH. *v. a.* 1. To colour; to redden (*Addison*). 2. To elate; to elevate (*Atterbu*).

FLUSH. *a.* 1. Fresh; full of vigour (*Cleave.*). 2. Affluent; abounding (*Arbuthnot*).

FLUSH. *s.* 1. Afflux; sudden impulse; violent flow (*Rogers*). 2. Cards all of a sort.

FLUSHING, a handsome, strong, and considerable town in Zealand, and in the island of Walcheren, with a good harbour, and a great foreign trade. It was put into the hands of queen Elizabeth as a security for the money she advanced. It is one of the three places which Charles V. advised Philip II. to preserve with care. It is four miles S. W. of Middleburg. Lon. 3. 35 E. Lat. 51. 29 N. This town was taken, in August, 1809, by the English under the command of earl Chatham.

To FLU'STER. *v. a.* (from *To flush.*) To make hot and rosy with drinking (*Shakspeare*).

FLU'STRA. Horn-wrack In zoology, a genus of the class vermes, order zoophyta. Animal, a polype proceeding from porous cells; stem fixed, foliaceous, membranaceous, consisting of numerous rows of cells united together and woven like a mat. Eighteen species; inhabitants of the European or Mediterranean seas, one or two of the Indian and Atlantic; eight found on the British coasts; adhering to fuci or other submarine substances.

F. chartacea may serve as an example. This, as its name evinces, is papyraceous, or of a thin semitransparent texture, like fine paper; of a very light straw colour, with cells on both sides; the tops of the branches sometimes digitated, sometimes irregularly divided, and truncate like the edge of an axe: the cells are oblong-square. It is found on the British shores, adhering to sea-wrack, shells, and rocks.

FLUTE, a musical instrument, the most simple of those which are played by the breath impelled from the lips. The common flute, or *flute a bec*, is a tube about eighteen inches in length and one in diameter; it has eight holes along the side, and the end is formed like a beak, to apply the lips to. The German flute consists of a tube formed of several joints or pieces screwed into each other, with holes disposed along the side, like those of the

common flute. It is stopped at the upper end, and furnished with moveable brass or silver keys, which, by opening and closing certain holes, serve to temper the tones to the various flats and sharps. In playing this instrument the performer applies his under lip to a hole about two inches and a half from the upper extremity, while the fingers, by their action on the holes and keys, accommodate the tones to the notes of the composition.

FLUTES, or FLUTINGS, in architecture, channels or cavities running perpendicularly along the shaft of a column or pilaster. They are chiefly affected in the Ionic order, in which they had their first rise; though they are also used in all the richer orders, as the Corinthian or Composite; but rarely in the Doric; and scarce ever in the Tuscan. Their number is usually twenty-four, though in the Doric it is only twenty. Each flute is hollowed exactly in a quadrant of a circle. Between the flutes are little spaces that separate them, called by Vitruvius, *striæ*, and by us, *lists*; though in the Doric, the flutes are frequently made to join each other, without any intermediate space at all, the list being sharpened off to a thin edge, which forms a part of each flute.

To FLUTE. *v. a.* To cut columns into hollows.

To FLUTTER. *v. n.* (ꝼlozeꝑan, Saxon.) 1. To take short flights with great agitation of the wing (*Deuteronomy*). 2. To move about with great show and bustle without consequence (*Grew*). 3. To be moved with quick vibrations or undulations (*Pope*). 4. To move irregularly (*Howel*).

To FLU'TTER. *v. a.* 1. To drive in disorder, like a flock of birds suddenly roused (*Shakspeare*). 2. To hurry the mind. 3. To disorder the position of any thing.

FLU'TTER. *s.* (from the verb.) 1. Vibration; undulation (*Addison*). 2. Hurry; tumult; disorder of mind. 3. Confusion; irregular position.

FLUVIATICK. *a.* (*fluviaticus*, Latin.) Belonging to rivers.

FLUX *s.* (*fluxus*, Latin.) 1. The act of flowing; passage (*Digby*). 2. The state of passing away and giving place to others (*Bro.*). 3. Any flow or issue of matter (*Arbuthnot*). 4. Dysentery; disease in which the bowels are excoriated and bleed; bloody flux (*Halifax*). 5. Excrement; that which falls from bodies (*Shakspeare*). 6. Concourse; confluence (*Shakspeare*). 7. The state of being melted. 8. That which mingled with the body makes it melt.

FLUX AND REFLUX OF THE SEA. See TIDES.

FLUX (*fluss*, German), in chemistry, any substance which is added to another to assist its fusion when heat is applied. Thus alkali is a flux for flint, as when mixed with it in due proportion, and heated, it causes it to melt into the compound called glass.

The term flux is almost exclusively, in chemistry, applied to those substances, often saline mixtures, that are added to minerals or metallic ores to assist in the process of reduction.

White flux is made simply by mixing equal parts of tartar or cream of tartar and nitre, and deflagrating them in a clean crucible. The nitrous acid burns the carbonaceous part of the tartar, and the mixed alkalies of the nitre and tartar alone remain. This flux is, therefore, little else than a pure subcarbonat of potash. The mixture of these substances before deflagration is called crude flux. But of all the saline reducing substances that most frequently employed is *black flux*. This is made by deflagrating in a large crucible a mixture of one part of nitre and two of tartar; and differs from the former in containing, besides carbonat of potash, a quantity of charcoal of the tartar, which there has not been nitre enough to consume. It therefore both assists in the fusion of ores by its alkaline ingredient, and oxygenates, and reduces them to the metallic state by means of its carbon.

In making this last flux, the materials, previously well mixed, should be thrown by small quantities into a red-hot crucible, and loosely covered after each projection; and as soon as the last portion is deflagrated, it should be removed from the fire, and kept in well-closed bottles to prevent the deliquescence of the alkali. Bergman however uses the term flux in a much more extensive sense; and intends by it not only substances useful in the reduction of metals, but substances capable of analyzing by the blowpipe saline, earthy, or inflammable matters. The fluxes recommended by him for this purpose are the following

1. The phosphoric acid, or rather the microcosmic salt, as it is called, which contains that acid partly saturated with mineral, partly with ammonia, and loaded besides with much water. This salt, when exposed to the flame, boils and foams violently, with a continual crackling noise, until the water and ammonia have flown off: afterwards it is less agitated, sending forth something like black scoriæ arising from the burned gelatinous part: these, however, are soon dispelled, and exhibit a pellucid sphericle encompassed by a beautiful green cloud, which is occasioned by the deflagration of the phosphorus, arising from the extrication of the acid by means of the inflammable matter. The clear globule which remains, upon the removal of the flame, continues longer soft than that formed by borax, and therefore is more fit for the addition of the matter to be dissolved. The ammonia is expelled by the fire, therefore an excess of acid remains in what is left behind, which readily attracts moisture in a cool place. 2. Soda, when put upon charcoal, melts superficially, penetrates the charcoal with a crackling noise, and then disappears. In the spoon it yields a permanent and pellucid sphericle, as long as it is kept fluid by the blue apex of the flame; but when the heat is diminished, it becomes

opaque, and assumes a milky colour. It attacks several earthy matters, particularly those of the siliceous kind, but cannot be employed on charcoal. 3. Crystallized borax, exposed to the flame urged by the blowpipe, or charcoal, first becomes opaque, white, and excessively swelled, with various protuberances, or branches proceeding out from it. When the water is expelled, it easily collects itself into a mass, which, when well fused, yields a transparent sphericle, retaining its transparency even after cooling. If calcined borax be employed, the clear sphericle is obtained the sooner.

Having provided every thing necessary, the following directions are next to be attended to. 1. A common tallow candle, not too thick, is generally preferable to a wax candle, or to a lamp. The snuff must not be cut too short, as the wick should bend towards the object. 2. The weaker exterior flame must first be directed upon the object, until its effects are discovered; after which the interior flame must be applied. 3. We must observe with attention whether the matter decrepitates, splits, swells, vegetates, boils, &c. 4. The piece exposed to the flame should scarcely ever exceed the size of a pepper-corn, but ought always to be large enough to be taken up by the forceps. 5. A small piece should be added separately to each of the fluxes; concerning which it must be observed whether it dissolves wholly or only in part; whether this is effected with or without effervescence, quickly or slowly; whether the mass is divided into a powder, or gradually and externally corroded; with what colour the glass is tinged, and whether it becomes opaque or remains pellucid.

Having given these directions, M. Bergman proceeds next to consider the subjects proper to be examined by the blowpipe. These he divides into four classes: 1. Saline; 2. Earthy; 3 Inflammable; and 4. Metallic. As the subject, however, is treated at considerable length, we shall refer the reader to Mr. Bergman's writings, and confine ourselves in this place to what he has advanced concerning the last of these subjects, namely, metallic substances.

The perfect metals, when calcined (oxygenated) in the moist way, recover their former nature by simple fusion. The imperfect metals are calcined by fire, especially by the exterior flame; and then, in order to their being reduced, indispensably require the contact of an inflammable substance. With respect to fusibility, the two extremes are mercury and platina; the former being scarcely ever seen in a solid form, and the latter almost as difficult of fusion. The metals, therefore, may be ranked in this order, according to their degrees of fusibility. 1. Mercury; 2. Tin; 3. Bismuth; 4. Lead; 5. Zinc; 6. Antimony; 7. Silver; 8. Gold; 9. Arsenic; 10. Cobalt; 11. Nickel; 12. Iron; 13. Manganese; 14. Platinum. The last two do not yield to the blowpipe, and indeed forged iron does not melt without difficulty; but cast iron perfectly.

Metals in fusion affect a globular form, and easily roll off the charcoal, especially when of the size of a grain of pepper. Smaller pieces, therefore, ought either to be used, or they should rest in hollows made in the charcoal. On their first melting they assume a polished surface, an appearance always retained by the perfect metals; but the imperfect are soon obscured by a pellicle formed of the calx (oxide) of the metal. The colours communicated by the calces vary according to the nature of the metal from which the calx is produced. Some of the calces easily recover their metallic form by simple exposure to flame upon the charcoal; others are reduced in this way with more difficulty; and some not at all. The reduced calces of the volatile metals immediately fly off from the charcoal. In the spoon they exhibit globules; but it is very difficult to prevent them from being first dissipated by the blast.

The metals are taken up by the fluxes; but as soda yields an opaque spherule, it is not to be made use of. Globules of borax dissolve and melt any metallic calx; and, unless too much loaded with it, appear pellucid and coloured. A piece of metal calcined in flux produces the same effect, but more slowly. A portion of the calx generally recovers its metallic form, and floats on the melted matter like one or more excrescences.

The calces of the perfect metals are reduced by borax in the spoon, and adhere to it at the point of contact, and there only. The microcosmic salt acts like borax, but does not reduce the metals. It attacks them more powerfully on account of its acid nature; at the same time it preserves the spherical form, and therefore is adapted in a peculiar manner to the investigation of metals.

The tinge communicated to the flux frequently varies, being different in the fused and in the cooled globule; for some of the dissolved calces, while fused, show no colour, but acquire one while cooling; but others, on the contrary, have a much more intense colour while in the state of fluidity. Should the transparency be injured by too great a concentration of colour, the globule, on compressing it with the forceps, or drawing it out into a thread, will exhibit a thin and transparent mass; but if the opacity arises from supersaturation, more flux must be added; and as the fluxes attract the metals with unequal forces, the latter precipitate one another.

Metals when mineralized by acids have the properties of metallic salts; when mineralized by carbonic acid, they possess the properties of calces, that volatile substance being easily expelled without any effervescence; but when combined with sulphur they possess properties of a peculiar kind. They may then be melted, or even calcined upon the charcoal, as also in a golden or silver spoon. The volatile parts are distinguished by the smell or smoke; the fixed residua, by the particles reduced or precipitated upon iron, or from the tinge of the fluxes.

Gold in its metallic state fuses on the charcoal, and is the only metal which remains un-

changed. It may be oxygenated in the moist way by solution in aqua regia; but to calcine it also by fire, we must pursue the following method: To a globule of microcosmic salt, let there be added a small piece of solid gold, of gold leaf, purple mineral, or, which is best of all, of the crystalline salt formed by a solution of gold in aqua regia containing sea-salt. Let this again be melted, and added while yet soft to turbith mineral, which will immediately grow red on the contact. The fusion being afterwards repeated, a vehement effervescence arises; and when this is considerably diminished, let the blast be stopped for a few moments, again begun, and so continued until almost all the bubbles disappear. After this the spherule, on cooling, assumes a ruby colour; but if this does not happen, let it be just made soft by the exterior flame, and upon hardening, this tinge generally appears. Should the process fail at first, owing to some minute circumstances which cannot be described, it will succeed on the second or third trial. The ruby-coloured globule, when compressed by the forceps while hot, frequently becomes blue; by sudden fusion it generally assumes an opal colour, which by refraction appears blue, and by reflection of a brown red. If further urged by the fire it loses all colour, and appears like water; but the redness may be reproduced several times by the addition of turbith mineral. The flux is reddened in the same manner by the addition of tin instead of turbith; but it has a yellowish hue, and more easily becomes opaque; while the redness communicated by turbith mineral has a purple tinge, and quite resembles a ruby. Borax produces the same phenomena, but more rarely; and in all cases the slightest variation in the management of the fire will make the experiment fail entirely.

The ruby colour may also be produced by copper; whence a doubt may arise, whether it is the gold or the remains of the copper that produce this effect. M. Bergman thinks it probable that both may contribute towards it, especially as copper is often found to contain gold

This precious metal cannot directly be mineralized by sulphur; but by the medium of iron is sometimes formed into a golden pyrites. Here, however, the quantity of gold is so small, that a globule can scarcely be extracted from it by the blowpipe.

Grains of native platinum are not affected by the blowpipe, either alone or mixed with fluxes; which, however, are frequently tinged green by it: but platinum, precipitated from aqua regia by vegetable or volatile alkali, is reduced by microcosmic salt to a small malleable globule. Our author has been able to unite seven or eight of these into a malleable mass; but more of them produced only a brittle one. Platinum scarcely loses all its iron, unless reduced to very thin fusion.

Silver in its metallic state easily melts, and resists calcination. Silver leaf fastened by means of the breath, or a solution of borax, may easily be fixed on it by the flame, and through the glass it appears of a gold colour; but care must be taken not to crack the glass. Calcined silver precipitated from nitrous acid by fixed alkali is easily reduced. The microcosmic acid dissolves it speedily and copiously; but on cooling it becomes opaque, and of a whitish yellow, which is also sometimes the case with leaf-silver. Copper is discovered by a green colour, and sometimes by that of a ruby, unless we choose rather to impute that to gold. The globules can scarcely be obtained pellucid, unless the quantity of calx is very small; but a longer fusion is necessary to produce an opacity with borax. The globule, loaded with dissolved silver during the time of its fusion in the spoon, covers a piece of copper with silver, and becomes itself of a pellucid green: antimony quickly takes away the milky opacity of dissolved luna cornea, and separates the silver in distinct grains. Cobalt, and most of the other metals, likewise, precipitate silver on the same principles as in the moist way, viz. by a double elective attraction. This metal, when mineralized by marine and vitriolic acids, yields a natural luna cornea, which produces a number of small metallic globules on the charcoal: it dissolves in microcosmic salt, and renders it opaque, and is reduced, partially at least, by borax. Sulphurated silver, called also the glassy ore of that metal, fused upon charcoal, easily parts with the sulphur it contains; so that a polished globule is often produced, which, if necessary, may be depurated by borax. The silver may also be precipitated by the addition of copper, iron, or manganese. When arsenic makes part of the compound, as in the red ore of arsenic, it must first be freed from the sulphur by gentle roasting, and finally entirely depurated by borax. It decrepitates in the fire at first.

Copper, together with sulphur and arsenic mixed with silver, called the white ore of silver, yields a regulus having the same alloy.

Galena, which is an ore of lead containing sulphur and silver, is to be freed in the same manner from the sulphur; after which the lead is gradually dissipated by alternately melting and cooling, or is separated in a cupel from the galena by means of the flame. Bergman has not been able to precipitate the silver distinct from the lead, but the whole mass becomes malleable; and the same is true of tin, but the mass becomes more brittle.

Pure mercury flies off from the charcoal with a moderate heat, the fixed heterogeneous matters remaining behind. When calcined, it is easily reduced and dissipated, and the fluxes take it up with effervescence; but it is soon totally driven off. When mineralized by sulphur, it liquefies upon the charcoal, burns with a blue flame, smokes, and gradually disappears; but, on exposing cinnabar to the fire on a polished piece of copper, the mercurial globules are fixed upon it all round.

Lead in its metallic state readily melts, and continues to retain a metallic splendour for some time. By a more intense heat it boils and smokes, forming a yellow circle upon the

charcoal. It communicates a yellow colour, scarcely visible, to the fluxes; and when the quantity is large, the globule, on cooling, contracts more or less of a white opacity. It is not precipitated by copper when dissolved; nor do the metals precipitate it from sulphur in the same order as from the acids. When united to carbonic acid, it grows red on the first touch of the flame; when the heat is increased it melts, and is reduced to a multitude of small globules. When united with phosphoric acid it melts, and yields an opaque globule, but is not reduced. With fluxes it shows the same appearance as oxide of lead. When mineralized by sulphur, lead easily liquefies, and being gradually deprived of the volatile part, yields a distinct regulus, unless too much loaded with iron. It may be precipitated by iron and copper.

A small piece of copper, either solid or foliated, sometimes communicates a ruby colour to fluxes, especially when assisted by tin or turbith mineral. If the copper is a little more or further calcined, it produces a green pellucid globule, the tinge of which grows weaker by cooling, and even verges towards a blue. By long fusion with borax, the colour is totally destroyed upon charcoal, but scarcely in the spoon. When once destroyed, this colour can scarcely be reproduced by nitre; but it remains fixed with microcosmic salt. If the calx or metal to be calcined is added in considerable quantity during fusion, it acquires an opaque red on cooling, though it appears green while pellucid and fused, but by a still larger quantity it contracts an opacity even while in fusion, and upon cooling a metallic splendour. Even when the quantity of copper is so small as scarcely to tinge the flux, a visible pellicle is precipitated upon a piece of polished iron added to it during strong fusion, and the globule in its turn takes the colour of polished iron; and in this way the smallest portions of copper may be discovered. The globule made green by copper, when fused in the spoon with a small portion of tin, yields a spherule of the latter mixed with copper, very hard and brittle: in this case the precipitated metal pervades the whole of the mass, and does not adhere to the surface. Cobalt precipitates the calx of copper dissolved in the spoon by a flux, in a metallic form, and imparts its own colour to glass, which nickel cannot do. Zinc also precipitates it separately, and rarely upon its own surface, as we can scarcely avoid melting it. When mineralized by the carbonic acid, copper grows black on the first contact of the flame, and melts in the spoon; on the charcoal the lower part, which touches the support, is reduced. With a superbundance of marine acid, it tinges the flame of a beautiful colour; but with a small quantity shows no appearance of the metal in that way. Thus the beautiful crystals of Saxony, which are cubic, and of a deep green, do not tinge the flame, though they impart a pellucid greenness to microcosmic salt. An opaque redness is easily obtained with borax: but Mr. Bergman could not produce this colour with microcosmic salt. Copper simply sulphurated, when cautiously and gently roasted by the exterior flame, yields at last by fusion a regulus surrounded with a sulphurated crust. The mass roasted with borax separates the regulus more quickly.

If a small quantity of iron happens to be present, the piece to be examined must first be roasted, after which it must be dissolved in borax, and tin added to precipitate the copper. The regulus may also be obtained by sufficient calcination and fusion, even without any precipitant, unless the ore is very poor. When the pyrites contain copper, even in the quantity of the one-hundredth part of their weight, its presence may be detected by these experiments. Let a grain of pyrites, of the size of a flax-seed, be roasted, but not so much as to expel all the sulphur; let it then be dissolved by borax, a polished rod of iron added, and the fusion continued until the surface when cooled loses all splendour. As much borax is required as will make the whole of the size of a grain of hemp-seed. Slow fusion is injurious, and the precipitation is also retarded by too great tenuity; but this may be corrected by the addition of a little lime. Too much calcination is also inconvenient; for by this the globule forms slowly, is somewhat spread, becomes knotty when warm, corrodes the charcoal, destroys the iron, and the copper does not precipitate distinctly. This defect is corrected by a small portion of crude ore. When the globule is properly melted, according to the directions already given, it ought to be thrown into cold water immediately on stopping the blast, in order to break it suddenly. If the copper contained in it is less than one-hundredth part, one end of the wire only has a cupreous appearance, but otherwise the whole.

Dr. Gahn has another method of examining the ores of copper, namely, by exposing a grain of the ore, well freed from sulphur by calcination, to the action of the flame driven suddenly upon it by intervals. At those instants a cupreous splendour appears on the surface, which otherwise is black; and this splendour is more quickly produced in proportion as the ore is poorer. The flame is tinged green by cupreous pyrites on roasting.

Forged iron is calcined, but can scarcely be melted. It cannot be melted by borax, though it may by microcosmic salt, and then it becomes brittle. Calcined iron becomes magnetic by being heated on the charcoal, but melts in the spoon. The fluxes become green by this metal; but in proportion as the oxygen is more abundant, they grow more of a brownish yellow. On cooling, the tinge is much weakened, and when originally weak, vanishes entirely. By too much saturation the globule becomes black and opaque. The sulphureous pyrites may be collected into a globule by fusion, and is first surrounded by a blue flame; but as the metal is easily calcined, and changes

into black scoriæ, neither by itself nor with fluxes does it exhibit a regulus. It grows red on roasting.

Tin easily melts before the blow-pipe, and is calcined. The fluxes dissolve the calx sparingly; and when saturated, contract a milky opacity. Some small particles of this metal dissolved in any flux may be distinctly precipitated upon iron. Crystallized ore of tin, urged by fire upon the charcoal, yields its metal in a reguline state.

Bismuth presents nearly the same appearances of lead; the calx is reduced on the coal, and fused in the spoon. The calx, dissolved in microcosmic salt, yields a brownish yellow globule, which grows more pale upon cooling, at the same time losing some of its transparency. Too much calx renders the matter perfectly opaque. Borax produces a similar mass in the spoon, but on the coal a grey one, which can scarcely be freed from bubbles. On fusion the glass smokes, and forms a cloud about it. Bismuth is easily precipitated by copper and iron. Sulphurated bismuth is easily fused, exhibiting a blue flame and sulphureous smell. Cobalt, when added, by means of sulphur, enters the globule; but the scoriæ soon swells into distinct partitions; which, when further urged by fire, throw out globules of bismuth. Sulphurated bismuth, by the addition of borax, may be distinctly precipitated by iron or manganese.

Regulus of nickel when melted is calcined, but more slowly than other metals. The calx imparts an hyacinthine colour to fluxes, which grows yellow on cooling, and by long-continued fire may be destroyed. If the calx of nickel is contaminated by ochre of iron, the latter is first dissolved. Nickel dissolved is precipitated on iron, or even on copper; an evident proof that it does not originate from either of these metals. Sulphurated nickel is no where found without iron and arsenic; the regulus is obtained by roasting, and fusing with borax, though it still remains mixed with some other metals.

Regulus of arsenic takes fire by a sudden heat, and not only deposits a white smoke on charcoal, but diffuses the same all around. The calx smokes with a smell of garlic, but does not burn. The fluxes grow yellow without growing opaque, on adding a proper quantity of calx, which is dispelled by a long continuance of the heat. This semimetal is precipitated in a metallic form by iron and copper, but not by gold. Yellow arsenic liquefies, smokes, and totally evaporates: when heated by the external flame, so as neither to liquefy nor smoke, it grows red, and yellow again upon cooling. When it only begins to melt, it acquires a red colour, which remains after cooling. Realgar liquefies more easily, and is besides totally dissipated.

Regulus of cobalt melts, and may partly be depurated by borax, as the iron is first calcined and taken up. The smallest portion of the calx tinges the flux of a deep-blue colour, which appears of a violet by refraction, and this colour is very fixed in the fire. Cobalt is precipitated upon iron from the blue globule, but not upon copper. When calx of iron is mixed with that of cobalt in a flux, the former is dissolved. This semimetal takes up about one-third of its weight of sulphur in fusion, after which it can hardly be melted again. It is precipitated by iron, copper, and several other metals. The common ore yields an impure regulus by roasting. The green cobalt, examined by our author, tinges the microcosmic salt blue; but at the same time shows red spots indicating copper.

Zinc exposed to the blow-pipe melts, takes fire, sending forth a beautiful bluish-green flame, which, however, is soon extinguished by a lanuginous calx: but if the reguline nucleus included in this lanuginous matter (commonly called flowers of zinc) is urged by the flame, it will be now and then inflamed, and, as it were, explode and fly about. With borax it froths, and at first tinges the flame. It continually diminishes, and the flux spreads upon the charcoal; but in fused microcosmic salt, it not only froths, but sends forth flashes with a crackling noise. Too great heat makes it explode with the emission of ignited particles. The white calx, or flowers, exposed to the flame on charcoal, becomes yellowish, and has a kind of splendour which vanishes when the flame ceases. It remains fixed, and cannot be melted. The fluxes are scarcely tinged, but when saturated by fusion, they grow opaque and white on cooling. Clouds are formed round the globules, of a nature similar to those of the metallic calx. Dissolved zinc is not precipitated by any other metal. When mineralized by carbonic acid gass, it has the same properties as calcined zinc. In the pseudo-galena sulphur and iron are present. These generally, on the charcoal, smell of sulphur, melt and tinge the flame more or less, depositing a cloud all around. Those which have no matrix are tinged by those which contain iron, and acquire by saturation a white opaque colour, verging to brown or black, according to the variety of composition.

Regulus of antimony, fused and ignited on the charcoal, affords a beautiful object; for if the blast of air be suddenly stopped, a thick white smoke rises perpendicularly, while the lower part round the globule is condensed into crystalline spiculæ, similar to those called argentine flowers. The calx tinges fluxes of an hyacinthine colour; but on fusion smokes, and is easily dissipated, especially on the charcoal, though it also deposits a cloud on it. The dissolved metal may be precipitated by iron and copper, but not by gold. Crude antimony liquefies on the charcoal, spreads, smokes, penetrates it, and at last disappears entirely, except a ring which it leaves behind.

Regulus of manganese scarcely yields to the flame. The black calx tinges the fluxes of a bluish colour; borax, unless saturated, communicates more of a yellow colour. The co-

lour may be gradually dissolved altogether by the interior flame, and again reproduced by a small particle of nitre, or the exterior flame alone. Combined with carbonic acid, it is of a white colour, which changes by ignition to black. In other respects it shows the same experiments as the black calx.

FLUX, in medicine, a disease generally described under the term dysentery, and in the nosology of Cullen denominated specifically dysenteria sanguinea. See DYSENTERIA.

FLUX. *a.* (*fluxus*, Latin.) Unconstant; not durable; maintained by a constant succession of parts.

To FLUX. *v. a.* 1. To melt. 2. To salivate; to evacuate by spitting (*South*).

FLUXI'LITY. *s.* (*fluxus*, Latin.) Easiness of separation of parts (*Boyle*).

FLU'XION. *s.* (*fluxio*, Latin.) 1. The act of flowing. 2. The matter that flows (*Wiseman*).

FLUXION, in the Newtonian analysis, denotes the velocity with which a flowing quantity is increased by its generative motion: by which it stands contradistinguished from fluent or the flowing quantity, which is gradually and indefinitely increasing, after the manner of a space which a body in motion describes.

Or, a fluxion may be more accurately defined, as, the magnitude by which any flowing quantity would be uniformly increased in a given portion of time, with the generating celerity at any proposed position, or instant, supposing it from thence to continue invariable.

From this definition it appears, that the fluxions of quantities are, always, as the celerities by which the quantities themselves increase in magnitude.

Mr. Simpson observes, that there is an advantage in considering fluxions, not as mere velocities, but as the magnitudes which these velocities would, uniformly, generate in a given finite time: the imagination is not here confined to a single point, and the higher orders of fluxions are rendered much more easy and intelligible. And though sir Isaac Newton defines fluxions to be the velocities of motions, yet he hath recourse to the increments or moments, generated in equal particles of time, in order to determine those velocities, which he afterwards teaches us to expound by finite magnitudes of other kinds.

Method of Fluxions, is the algorithm and analysis of fluxions, and fluents or flowing quantities.

Most foreigners define this as the method of differences or differentials, being the analysis of indefinitely small quantities. But Newton, and other English authors, call these infinitely small quantities, moments; considering them as the momentary increments of variable quantities; as of a line considered as generated by the flux or motion of a point, or of a surface generated by the flux of a line. Accordingly, the variable quantities are called fluents, or flowing quantities; and the method of finding either the fluxion or the fluent, the method of fluxions.

M. Leibnitz considers the same infinitely small quantities as the differences, or differentials of quantities; and the method of finding those differences, he calls the *differential calculus*.

Besides this difference in the name, there is another in the notation. Newton expresses the fluxion of a quantity, as of x, by a dot placed over it, thus $\dot{x}$; while Leibnitz expresses his differential of the same x, by prefixing the initial letter d, as dx. But, setting aside these circumstances, the two methods are just alike; though the principles on which they are established are different: *fluxions* being referred to the doctrine of motion; *differentials* to such a kind of augmentation as is more directly referable to analysis.

The method of fluxions is one of the greatest, most subtle, and sublime discoveries of perhaps any age: it opens a new world to our view, and extends our knowledge, as it were, to infinity; carrying us beyond the bounds that seemed to have been prescribed to the human mind, at least infinitely beyond those to which the ancient geometry was confined.

The history of this important discovery, recent as it is, is a little dark, and embroiled. Two of the greatest men of the last age have both of them claimed the invention, sir Isaac Newton, and M. Leibnitz; and nothing can be more glorious for the method itself, than the zeal with which the partizans of either side have asserted their title.

The two great authors themselves, without any seeming concern, or dispute, as to the property of the invention, enjoyed the prospect of the progresses continually making under their auspices, till the year 1699, when the peace began to be disturbed.

M. Facio, in a Treatise on the Line of Swiftest Descent, declared, that he was obliged to own Newton as the first inventor of the differential calculus, and the first by many years; and that he left the world to judge, whether Leibnitz, the second inventor, had taken any thing from him. This precise distinction between first and second inventor, with the suspicion it insinuated, raised a controversy between M. Leibnitz, supported by the editors of the Leipsic Acts, and the English mathematicians, who declared for Newton. Sir Isaac himself never appeared on the scene; his glory was become that of the nation; and his adherents, warm in the cause of their country, needed not his assistance to animate them.

Writings succeeded each other but slowly, on either side; probably on account of the distance of places; but the controversy grew still hotter and hotter: till at length M. Leibnitz, in the year 1711, complained to the Royal Society, that Dr. Keil had accused him of publishing the Method of Fluxions invented by sir I. Newton, under other names and characters. He insisted that nobody knew better than sir Isaac himself, that he had stolen nothing from him; and required that Dr. Keil should disavow the ill construction which might be put upon his words.

The society, thus appealed to as a judge, appointed a committee to examine all the old letters, papers, and documents, that had passed among the several mathematicians, relating to the point; who after a strict examination of all the evidence that could be procured, gave in their report as follows: "That Mr. Leibnitz was in London in 1673, and kept a correspondence with Mr. Collins by means of Mr. Oldenburgh, till September 1676, when he returned from Paris to Hanover, by way of London and Amsterdam: that it did not appear that Mr. Leibnitz knew any thing

of the differential calculus before his letter of the 21st of June, 1677, which was a year after a copy of a letter, written by Newton in the year 1672, had been sent to Paris to be communicated to him, and above four years after Mr. Collins began to communicate that letter to his correspondents; in which the Method of Fluxions was sufficiently explained, to let a man of his sagacity into the whole matter; and that sir I. Newton had even invented his method before the year 1669, and consequently 15 years before M. Leibnitz had given any thing on the subject in the Leipsic Acts." From which they concluded that Dr. Keil had not at all injured M. Leibnitz in what he had said.

The society printed this their determination, together with all the pieces and materials relating to it, under the title of Commercium Epistolicum de Analysi Promota, 8vo. Lon 1712. This book was carefully distributed through Europe, to vindicate the title of the English nation to the discovery; for Newton himself, as already hinted, never appeared in the affair. whether it was that he trusted his honour with his compatriots, who were zealous enough in the cause; or whether he felt himself even superior to the glory of it.

M. Leibnitz and his friends however could not shew the same indifference: he was accused of a theft; and the whole Commercium Epistolicum either expresses it in terms, or insinuates it. Soon after the publication therefore, a loose sheet was printed at Paris, in behalf of M. Leibnitz, then at Vienna. It is written with great zeal and spirit; and it boldly maintains that the Method of Fluxions had not preceded the Method of Differences; and even insinuates that it might have arisen from it. The detail of the proofs however, on each side, would be too long, and could not be understood without a large comment, which must enter into the deepest geometry.

M. Leibnitz had begun to work upon a Commercium Epistolicum, in opposition to that of the Royal Society; but he died before it was completed.

A second edition of the Commercium Epistolicum was printed at London in 1722; when Newton, in the preface, account, and annotations, which were added to that edition, particularly answered all the objections which M. Leibnitz and Bernoulli were able to make since the Commercium first appeared in 1712; and from the last edition of the Commercium, with the various original papers contained in it, it evidently appears that Newton had discovered his Method of Fluxions many years before the pretensions of Leibnitz. See also Raphson's History of Fluxions, and the valuable account of the Commercium Epistolicum, given in vol. 29 of the Philosophical Transactions, or New Abridgement, vol. 6. pp. 116—153

There are however, according to the opinion of some, strong presumptions in favour of Leibnitz; i. e. that he was no plagiary: for that Newton was at least the first inventor, is past all dispute; his glory is secure; the reasonable part, even among the foreigners, allow it: and the question is only, whether Leibnitz took it from him, or fell upon the same thing with him; yet Leibnitz himself acknowledges, that in 1676, being in England, he staid some days in London, where he became acquainted with Collins, who shewed him several letters from Gregory, Newton, and other mathematicians, which turned chiefly on series. This visit to England was probably occasioned by Collins's communication of the letter of 1672; and though we, instead of positive, have only presumptive proof, we are decidedly of opinion that Leibnitz saw, in Collins's possession, papers which acquainted him with Newton's discovery. We request that the reader will compare with Leibnitz's acknowledgment the following relation, for the truth of every part of which we hold ourselves responsible.

In the year 1669, amongst other series by sir Isaac Newton, one for finding the arc of a circle from the sine, and, in 1671, another by Mr. Gregory, for finding the arc from the tangent, were sent to Mr Collins, who was very free in communicating these and other discoveries. In 1674 Leibnitz mentions in a letter to Oldenburgh his being possessed of the first series; and the next year those of both Newton and Gregory were sent by Oldenburgh to Leibnitz. But in 1676 Leibnitz dropped his pretensions to the first series, not being able to demonstrate it, and sent to Oldenburgh, as his own, that of Gregory, with a demonstration. Both Newton and Gregory admitted that Leibnitz found out this series; for they knew nothing of Oldenburgh's letter, the copy of which lay buried for more than 30 years among the papers of the Royal Society. so that at length, though not till 1713, Leibnitz was compelled to acknowledge Gregory as the original author. Nay, from the whole tenour of this gentleman's conduct, he may be justly suspected of having often learned by information what he affirmed to have invented: for he pretended to Mouton's differential method; to a property of a series that had been discovered by Pascal; to four or five different series invented by Newton; to a method of progression; to the differential analysis, when it is certain he was ignorant of it; and lastly, to some of the principal propositions in the Principia. Newton's grand work was first published in 1686: it was criticised at Leipsic by Leibnitz, in a review managed by himself, in 1687; and, two years afterwards, he pretended to have invented some propositions contained in the Principia, relative to the motion of the planets in ellipses. Well might this gentleman be characterised as having "a vast and devouring genius!" for he was determined to devour every choice morsel that fell in his way We attempt not to depreciate his talents: but that he was a plagiary by regular habit there can be no reasonable doubt; and that he should abstain from appropriating to himself unjustly the greatest mathematical invention of any age, when he seized greedily every smaller discovery, is contrary to all the laws of human thought and all the rules of human action.

Direct method of Fluxions.—All finite magnitudes are here conceived to be resolved into infinitely small ones, supposed to be generated by motion, as a line by the motion of a point, a superficies by a line, and a solid by a superficies; and they are the elements, moments, or differences, thereof.

The art of finding these infinitely small quantities, or the velocities by which they are generated, and of working on them, and discovering other infinite quantities, by their means, makes the direct method of fluxions.

What renders the knowledge of infinitely small quantities of such great use and extent is, that they have relations to each other, which the finite magnitudes, whereof they are the infinitesimals, have not.

Thus e. gr. in a curve, of any kind whatever,

the infinitely small differences of the ordinate and absciss have the ratio to each other, not of the ordinate and absciss, but of the ordinate and subtangent; and, of consequence, the absciss and ordinate alone being known, give the subtangent unknown; or, which amounts to the same, the tangent itself.

The method of notation in fluxions, introduced by the inventor sir I. Newton, is thus:

The variable, or flowing quantity, to be uniformly augmented, as suppose the absciss of a curve, he denotes by the final letters v, x, y, z; and their fluxions by the same letters with dots placed over them, thus, $\dot{v}$ $\dot{x}$ $\dot{y}$ $\dot{z}$. And the initial letters a, b, c, d, &c. are used to express invariable quantities.

Again, if the fluxions themselves are also variable quantities, and are continually increasing, or decreasing, he considers the velocities with which they increase or decrease, as the fluxions of the former fluxions, or second fluxions; which are denoted by two dots over them, thus, $\ddot{y}$ $\ddot{x}$ $\ddot{z}$.

After the same manner one may consider the augments, and diminutions of these, as their fluxions also; and thus proceed to the third, fourth, &c. fluxions, which will be noted, thus, $\dddot{y}$ $\dddot{x}$ $\dddot{z}$: $\ddddot{y}$ $\ddddot{x}$ $\ddddot{z}$, &c. We may observe in general, that the fluxions of all kinds and orders whatever are contemporaneous, or such as may be generated together, with their respective celerities, in one and the same time.

Lastly, if the flowing quantity be a surd, as $\sqrt{a-b}$; he notes its fluxion $\left(\sqrt{a-b}\right)^{\cdot}$: if a fraction $\frac{x\,x}{d-y}$ he notes it, $\left(\frac{x\,x}{d-y}\right)^{\cdot}$.

The chief scope and business of fluxions is, from the flowing quantity given to find the fluxion: for this we shall lay down one general rule, as stated by Dr. Wallis, and afterwards apply and exemplify it in the several cases. "Multiply each term of the equation separately by the several indices of the powers of all the flowing quantities contained in that term; and in each multiplication, change one root or letter of the power into its proper fluxion: the aggregate of all the products connected together by their proper signs, will be the fluxion of the equation desired."

The application of this rule will be contained in the following cases:

I. *To express the fluxions of simple variable quantities, as already mentioned.*—Put the letter, or letters, which express them, with a dot over them: thus, fluxion of x is $\dot{x}$ and the fluxion of y is $\dot{y}$, and the fluxion of $x+y+v+z$, is $\dot{x}+\dot{y}+\dot{v}+\dot{z}$, &c.

Note. For the fluxion of permanent quantities, when any such are in the equation, imagine 0, or a cypher; for such quantities can have no fluxion, properly speaking, because they are without motion, or invariable. Again, the fluxion of a quantity, which decreases, instead of increasing, is to be considered as negative.

II. *To find the fluxions of the products of two or more variable or flowing quantities.*—Multiply the fluxion of each simple quantity by the factors of the products, or the product of all the rest; and connect the last products by their proper signs: then the sum, or aggregate, is the fluxion sought.

Thus, the fluxion of xy, is $\dot{x}y+x\dot{y}$. For, let two right lines, DE and FG, move parallel to themselves from two other right lines, BA and BC, (Plate 68. fig. 10.) and generate the rectangle DF. Let them always intersect each other in the curve BHR, and let Dd $(\dot{x})$ and Ff $(\dot{y})$ be the fluxions of the sides BD (x) and BF (y); and draw dm and sn parallel to DH and FH. The fluxion of the area BDH is Dm or $y\dot{x}$, and that of the area BFH is Fn or $x\dot{y}$, and therefore the fluxion of the whole rectangle EF $=xy=$ BDH + BFG will be $\dot{x}y+x\dot{y}$. The fluxion of yzu is $\dot{y}zu+y\dot{z}u+yz\dot{u}$; for if x be put $=zu$, then yzu will be $=yx$, and its fluxion $=y\dot{x}+x\dot{y}$: but x being $=zu$, and $\dot{x}=\dot{z}u+\dot{u}z$, $y\dot{x}+x\dot{y}$, by substitution, will be $=yz\dot{u}+yu\dot{z}+\dot{y}zu$. And the fluxion of $xuyz$, is $xuy\dot{z}+xu\dot{y}z+x\dot{u}yz+\dot{x}uyz$; and the fluxion of $\overline{a+x}\times\overline{b-y}$ (the common product being $ab+bx-ya-xy$) will be $b\dot{x}-\dot{y}a-\dot{x}y-x\dot{y}$.

The fluxion of the square of a variable quantity being settled upon sound and unexceptionable principles, that of the product of two variable quantities might be proved thus; without the consideration of quantities indefinitely less than others.

$$\text{Flux. } x=\dot{x}$$

$$\text{Flux } y=\dot{y}$$

$$\text{Flux. } (x+y)=\dot{x}+\dot{y}$$

$$\text{Flux. } (x+y)^2=2\times(x+y)\times(\dot{x}+\dot{y})$$

That is,

$$\text{Flux. } x^2+2xy+y^2=2x\dot{x}+2x\dot{y}+2y\dot{x}+2y\dot{y}$$

$$\text{or, } 2x\dot{x}+2y\dot{y}+\text{fl. } 2xy=2x\dot{x}+2x\dot{y}+2y\dot{x}+2y\dot{y}$$

Taking away the common quantities from both members of the equation, leaves

$$\text{Flux. } 2xy=2x\dot{y}+2y\dot{x}$$

$$\text{or, } 2\text{ Flux. } xy=2(x\dot{y}+y\dot{x})$$

$$\text{or, Flux. } xy=x\dot{y}+y\dot{x}.$$

Otherwise, thus:

$$\text{Make } x+y=s.$$

$$\text{Then } x^2+2xy+y^2=s^2$$

$$\text{whence } xy=\tfrac{1}{2}s^2-\tfrac{1}{2}x^2-\tfrac{1}{2}y^2$$

$$\text{Flux. } xy=s\dot{s}-x\dot{x}-y\dot{y}$$

$$\text{But, since } s=x+y,\ \dot{s}=\dot{x}+\dot{y}$$

$$\text{Flux. } xy=(x+y)(\dot{x}+\dot{y})-x\dot{x}-y\dot{y}$$

$$=x\dot{x}+x\dot{y}+y\dot{x}+y\dot{y}-x\dot{x}-y\dot{y}$$

$$=x\dot{y}+y\dot{x}, \text{ as before.}$$

III. *To find the fluxion of a fraction.*—Multiply the fluxion of the numerator by the denominator, and from this product subtract the fluxion of the denominator drawn into the numerator; and this will be the numerator, and the square of the denominator will be the denominator of the fraction expressing the fluxion of the given fraction.

Thus the fluxion of $\frac{x}{y}$

For suppose $\frac{x}{y}=z$, then will $x=yz$, which equal quantities must have equal fluxions; therefore $\dot{x}=y\dot{z}+z\dot{y}$ and $\dot{x}-z\dot{y}=\dot{z}y$; and dividing all

by y, $\frac{\dot{x}-\dot{z}y}{y}=\dot{z}$ = (because $\frac{x}{y}=z$) $\frac{\dot{x}-\frac{x}{y}\dot{y}}{y}$ = $\frac{\dot{x}y-x\dot{y}}{y}\div y=\frac{\dot{x}y-x\dot{y}}{yy}$: wherefore this last is the fluxion of the fraction $\frac{x}{y}=z$; because z being $=\frac{x}{y}$, $\dot{z}$ will be equal to the fluxion of $\frac{x}{y}$.

And the fluxion of $\frac{a}{x}$ will be $\frac{-\dot{x}a}{xx}$; for the permanent quantity a having no fluxion, there can be no product of the fluxion of the numerator into the denominator, as there would have been, had a been x, z, or any other variable quantity.

IV. *To find the fluxion of a power.*—Multiply the fluxion of the root by the exponent of the power, and the product by that power of the same root, whose exponent is less by unit than the given exponent; and likewise by the invariable quantity and co-efficient, if there be any.

Thus, the fluxion of xx will be $2x\dot{x}$; for $xx = x\times x$; but the fluxion of $x\times x=\dot{x}x+x\dot{x}=2x\dot{x}$, &c. and the fluxion of x^3 will be $3xx\dot{x}$. That of x^8 will be $8x^7\dot{x}$, &c. that of $5x^5$ will be $25x^4\dot{x}$; that of $3ax^4$ will be $12ax^3\dot{x}$.

Or, if m express the index of any power, as suppose x^m; its fluxion will be $mx^{m-1}\dot{x}$.

If the power be produced from a binomial, &c. as suppose $\overline{x+y}|^2$, or $xx+2xy+yy$, its fluxion will be $2\times\overline{x+y}\times\overline{\dot{x}+\dot{y}}$, or $2x\dot{x}+2\dot{x}y+2x\dot{y}+2y\dot{y}$.

If the exponent be negative, as suppose x^{-m} or $\frac{1}{x^m}$ its fluxion will be $-m\dot{x}x^{-m-1}$.

Or, if it be done by way of fraction, $\frac{-mx^{m-1}\dot{x}}{x^{2m}}$ (for the square of x^m is x^{2m}) $=-mx^{m-1-2m}\dot{x}=-mx^{-m-1}\dot{x}$ as before; or, removing x^{-m-1} to the denominator, by changing the sign of the exponent, $\frac{-m\dot{x}}{x^{m+1}}$.

If the power be imperfect, i. e. if its exponent be a fraction, as suppose $\sqrt[n]{x^m}$; or in the other notation $x^{\frac{m}{n}}$, suppose $x^{\frac{m}{n}}=z$: then if each member be elevated to the power of n, it will stand thus, $x^m=z^n$; the fluxion of which will be, by this general rule, $mx^{m-1}\dot{x}=nz^{n-1}\dot{z}$.

Wherefore $\dot{z}$ will be $=\frac{m\dot{x}x^{m-1}}{nz^{n-1}}$ (by dividing both parts by nz^{n-1}) and $\frac{m\dot{x}x^{m-1}}{nz^{n-1}}=\frac{m}{n}\times\frac{x^{m-1}}{z^{n-1}}\times\dot{x}$; or $\frac{m}{n}\dot{x}\sqrt[n]{x^{m-n}}$, putting instead of z^{n-1}, its value $x^{\frac{mn-m}{n}}$, and the above expression will become $\frac{m}{n}\dot{x}\times\frac{x^{m-1}}{x^{\frac{mn-m}{n}}}=\frac{m}{n}\dot{x}\times x^{m-1-\frac{mn+m}{n}}$ = $\frac{m}{n}\dot{x}\times x^{\frac{mn-n-mn+m}{n}}=\frac{m}{n}\dot{x}\times x^{\frac{m-n}{n}}=\frac{m}{n}\dot{x}\sqrt[n]{x^{m-n}}$. Or, more briefly, according to the rule, the fluxion of $\sqrt[n]{x^m}$ or $x^{\frac{m}{n}}$ will be $\frac{m}{n}\times\dot{x}\times x^{\frac{m}{n}-1}=\frac{m}{n}\dot{x}x^{\frac{m-n}{n}}$, &c.

V. *To find the fluxions of surd quantities.*—Suppose it required to find the fluxion of $\sqrt{2rx-xx}$, or $\overline{2rx-xx}|^{\frac{1}{2}}$. Suppose $\overline{2rx-xx}|^{\frac{1}{2}}=z$; then is $2rx-xx=zz$; and consequently $r\dot{x}-x\dot{x}=z\dot{z}$; and, by division, $\frac{r\dot{x}-x\dot{x}}{z}=\dot{z}=$ (by substitution)

$$\frac{r\dot{x}-x\dot{x}}{\sqrt{2rx-xx}}$$ = to the fluxion of $\sqrt{2rx-xx}$.

Or, by the preceding rule, the fluxion of $\overline{2rx-xx}|^{\frac{1}{2}}$ will be $\frac{1}{2}\times\overline{2r\dot{x}-2x\dot{x}}\times\overline{2rx-xx}|^{\frac{1}{2}-1}=\overline{r\dot{x}-x\dot{x}}\times\overline{2rx-xx}|^{-\frac{1}{2}}=\frac{r\dot{x}-x\dot{x}}{\overline{2rx-xx}|^{\frac{1}{2}}}$.

If it be required to find the fluxion of $\overline{ay-xx}|^{\frac{3}{2}}$; for $\overline{ay-xx}|^{\frac{3}{2}}$ put z; then $ay-xx=z^{\frac{2}{3}}$ and $a\dot{y}-2x\dot{x}=\frac{2}{3}\dot{z}z^{-\frac{1}{3}}$, and multiplying by 3, $3a\dot{y}-6x\dot{x}=2\dot{z}z^{-\frac{1}{3}}$; and, consequently, $3az^{\frac{1}{3}}\dot{y}-6z^{\frac{1}{3}}x\dot{x}=2\dot{z}$; equal (substituting $\overline{ay-xx}|^{\frac{1}{2}}=z^{\frac{1}{3}}$) $3a^3y^2\dot{y}-6a^2x^2a^2y\dot{y}+3ax^4\dot{y}-6a^2y^2x\dot{x}+12ayx^3\dot{x}-6x^5\dot{x}$ = to the fluxion of $\overline{ay-xx}|^{\frac{3}{2}}$.

To find the fluxion of $\sqrt[3]{a+bx+cx^2+dx^3}$. Put $\sqrt[3]{a+bx+cx^2+dx^3}=z^{\frac{1}{3}}$. Then $(z^{\frac{1}{3}})=\frac{1}{3}z^{\frac{1}{3}-1}\dot{z}=\frac{\dot{z}}{3\sqrt[3]{z^2}}$ = by restitution, &c. $\frac{b\dot{x}+2cx\dot{x}+3dx^2\dot{x}}{3\sqrt[3]{\overline{a+bx+cx^2+dx^3}|^2}}$.

By a similar process the fluxion of $\sqrt[n]{a+bx+cx^2+dx^3+ex^4+\text{ \&c. to } mx^n}$ is found to be $\frac{(b+2cx+3dx^2+4ex^3+\text{ \&c. to } (m-1)\,lx^{n-1})\dot{x}}{n(a+bx+cx^2+dx^3+ex^4+\text{ \&c. to } mx^n)^{\frac{n-1}{n}}}$

VI. *To find the fluxion of quantities compounded of rational and surd quantities.*—Let it be required to find the fluxion of $\overline{bx^2+cax+ea^2}\times\sqrt{xx+aa}=z$. Put $bx^2+cax+ea^2=p$, and $\sqrt{xx+aa}=q$. Then the given quantity is $pq=z$, and the fluxion thereof is $p\dot{q}+q\dot{p}=\dot{z}$: but $\dot{q}$ is $=\frac{x\dot{x}}{\sqrt{xx+aa}}$, and $\dot{p}$ is $=2bx\dot{x}+ca\dot{x}$; therefore, in the equation $p\dot{q}+q\dot{p}=\dot{z}$, if in the place of p, q, $\dot{p}$, $\dot{q}$, we restore the quantities they represent, we shall have

$$\frac{\overline{bx^3+cax^2+ea^2x}\times\dot{x}}{\sqrt{x^2+aa}}+2bx\dot{x}\times\sqrt{x^2+a^2}+ca\dot{x}\times\sqrt{x^2+a^2}=\dot{z}.$$

Which being reduced to one denomination, gives

$\dfrac{\overline{3bx^3+2acx^2+ca^2x+2ba^2x+ca^2x} \times \dot{x}}{\sqrt{xx+aa}} = \dot{z} =$ the fluxion of the given quantity.

VII. *To find the fluxion of a logarithm.*—The fluxion of the hyperbolic logarithm of any quantity is equal to the fluxion of that quantity divided by the quantity itself: e. gr. the fluxion of the hyperbolic logarithm of x is $= \dfrac{\dot{x}}{x}$: the fluxion of the common logarithm of x (viz. $\dfrac{x}{\mathrm{L}x}$) will be $= \dfrac{\dot{x}}{x} \times \mathrm{M}$; or, the fluxion of the hyperbolic logarithm of any number multiplied by M or 0.43429, &c. is = the fluxion of the common logarithm of the said number.

VIII. *To find the fluxion of exponential quantities, that is, quantities which have their exponent a flowing or variable letter.*—These are of two kinds, viz. when the root is a constant quantity, as e^x; and when the root is variable, as y^x.

In the former case, put the proposed exponential $e^x = z$, a single variable quantity, then take the logarithm of each, so shall log. of $z = x \times$ log. of e; take the fluxions of these, so shall $\dfrac{\dot{z}}{z} = \dot{x} \times$ log of e; hence $\dot{z} = z\dot{x} \times$ log of $e = e^x \dot{x} \times$ log of e, the fluxion of the proposed exponential e^x, and which therefore is equal to the said proposed quantity, drawn into the fluxion of the exponent, and also into the log. of the root.

Also in the second case, put the exponential $y^x = z$; then the logarithms give log. $z = x \times$ log. y, and the fluxions give $\dfrac{\dot{z}}{z} = \dot{x} \times$ log. $y + x \times \dfrac{\dot{y}}{y}$; hence $\dot{z} = z\dot{x} \times$ log $y + \dfrac{zx\dot{y}}{y} =$ (by substituting y^x for z) $y^x \dot{x} \times$ log. $y + xy^{x-1}\dot{y}$, is the fluxion of the proposed exponential y^x; which therefore consists of two terms, of which the one is the fluxion of the proposed quantity considering the exponent only as constant, and the other is the fluxion of the same quantity considering the root as constant.

IX. *To find the fluxion of a rectangle, when one side x increases, and the other y decreases.*—In this case the fluxion of the decreasing quantity is negative with respect to that of the increasing quantity (see the beginning of this article), and therefore, the sign of the term affected with it ought to be changed; e. gr the fluxion of the rectangle xy in these circumstances will be expressed by $\dot{x}y - x\dot{y}$.

X. *To find the fluxions of sines, cosines, &c.*—Suppose we require the fluxion of sin z, that is, the sine of the angle or arc denoted by z, we must suppose that by a motion of one of the legs including the angle, it becomes $z + \dot{z}$, then sin $(z + \dot{z})$ − sin z is the fluxion of sin z. But according to the formulæ for the sines of sums of arcs (see Sine and Trigonometry), we have $\sin(z+\dot{z}) = \sin z \cos \dot{z} + \sin \dot{z} \cos z$ the radius being assumed equal to unity. But the sine of an arc indefinitely small does not differ sensibly from that arc itself, nor its cosine differ perceptibly from radius: hence we have $\sin \dot{z} = \dot{z}$, and $\cos \dot{z} = 1$; and therefore $\sin(z+\dot{z}) = \sin z + \dot{z}\cos z$; whence $\sin(z+\dot{z}) - \sin z$, or $(\sin z)^{\cdot} = \dot{z}\cos z$: viz. the fluxion of the sine of an arc whose radius is unity, is equal to the product of the fluxion of the angle into the cosine of the same arc.

In like manner the fluxion of cos z, or $\cos(z+\dot{z}) - \cos z = \cos z \cos \dot{z} - \sin z \sin \dot{z} - \cos z$, since(art. Sine) $\cos(z+\dot{z}) = \cos z \cos \dot{z} - \sin z \sin \dot{z}$: therefore, because $\sin \dot{z} = \dot{z}$, and $\cos \dot{z} = 1$, we have $(\cos z)^{\cdot} = \cos z - \dot{z}\sin z - \cos z = -\dot{z}\sin z$: that is, the fluxion of the cosine of an arc, radius being 1, is found by multiplying the fluxion of the arc (taken with a contrary sign) by the sine of the same arc.

By means of these two formulæ, many other fluxional expressions may be found. As that

$(\cos mz)^{\cdot} = -m\dot{z}\sin mz.$

$(\sin mz) = +m\dot{z}\cos mz.$

$(\tan z)^{\cdot} = \left(\dfrac{\sin z}{\cos z}\right)^{\cdot} = \dfrac{\dot{z}(\cos^2 z - \sin^2 z)}{\cos^2 z} = \dfrac{\dot{z}}{\cos^2 z}$

$(\text{cotan } z)^{\cdot} = -\dfrac{\dot{z}}{\sin^2 z}.$

$(\sec z)^{\cdot} = \dfrac{\dot{z}\sin z}{\cos^2 z}.$

$(\text{cosec } z)^{\cdot} = -\dfrac{\dot{z}\cos z}{\sin^2 z}.$

$(\sin^m z) = m\sin^{m-1} z\,\dot{z}\cos z.$

$(\cos^m z)^{\cdot} = -m\cos^{m-1} z\,\dot{z}\sin z.$

XI. *To find the second, third, &c. fluxion of a flowing quantity.*—These fluxions differ in nothing, except their order and notation, from first fluxions, being actually such to the quantities from which they are immediately derived; and therefore, they may be found, in the same manner, by the general rules already delivered.

Thus, by the 4th rule, the first fluxion of x^3 is $3x^2\dot{x}$; and if $\dot{x}$ be supposed constant, or if the root x be generated with an equable celerity, the fluxion of $3x^2\dot{x}$, or $3\dot{x} \times x^2$, will be $3\dot{x} \times 2x\dot{x} = 6x\dot{x}^2$, which is the second fluxion of x^3; and $6\dot{x}^3$ will be its third fluxion: but if the celerity with which x is generated be variable, either increasing or decreasing, then $\dot{x}$ being variable, will have its fluxion denoted by $\ddot{x}$, &c. In this case the fluxion of $3x^2 \times \dot{x}$ will be, by the 2d and 4th rules, $6x\dot{x} \times \dot{x} + 3x^2 \times \ddot{x} = 6x\dot{x}^2 + 3x^2\ddot{x}$, the second fluxion of x^3. And the third fluxion of x^3 obtained in like manner from the last, will be $6\dot{x} \times \dot{x}^2 + 6x \times 2\dot{x}\ddot{x} + 6\dot{x}\ddot{x} \times x + 3x^2\dddot{x} = 6\dot{x}^3 + 18x\dot{x}\ddot{x} + 3x^2\dddot{x}$. Thus also, if $\dot{y} = nx^{n-1}\dot{x}$ then $\ddot{y} = n \times \overline{n-1} \times x^{n-2}\dot{x}^2 + nx^{n-1}\ddot{x}$; and if $z^2 = xy$, then $2\dot{z}\dot{z} = \ddot{x}y + \dot{y}\dot{x}$, &c.

If the function proposed were ax_n we should find $(ax_n)^{\cdot} = nax^{n-1}\dot{x}$: the factors na and $\dot{x}$ being regarded as constant in the first fluxion $nax^{n-1}\dot{x}$, to obtain the second fluxion it will suffice to

make x^{n-1} flow and to multiply the result by $na\dot{x}$. But $(x^{n-1})^{\cdot} = (n-1)x^{n-2}\dot{x}$ we have, therefore,

$$(ax^n)^{\cdot\cdot} = n(n-1)ax^{n-2}\dot{x}^2$$

In a similar manner, we find,

$$(ax^n)^{\because} = n(n-1)(n-2)ax^{n-3}\dot{x}^3$$

$$(ax^n)^{::} = n(n-1)(n-2)(n-3)ax^{n-4}\dot{x}^4, \&c.$$

And the fluxional coefficients will have the following values:

$$\frac{(ax^n)^{\cdot}}{\dot{x}} = nax^{n-1}$$

$$\frac{(ax^n)^{\cdot\cdot}}{\ddot{x}} = n(n-1)ax^{n-2}$$

$$\frac{(ax^n)^{\because}}{\dddot{x}} = n(n-1)(n-2)ax^{n-3}$$

$$\frac{(ax^n)^{::}}{\ddddot{x}} = n(n-1)(n-2)(n-3)ax^{n-4} \quad \&c.$$

Hence it is manifest that in the case where the exponent n is a positive whole number, the function ax^n has only a limited number of fluxions, of which the most elevated is $(\cdot)^n ax^n = n(n-1)(n-2)\ldots 2.1.a\dot{x}^n$; an expression which is no longer susceptible of fluxing, since it contains no more variable quantities.

Inverse method of fluxions, relates to the finding of fluents, and is of great utility though of considerable difficulty.

As it is only in certain particular forms and cases that the fluents of given fluxions can be found; there being no method of performing this universally a priori, by a direct investigation; like finding the fluxion of a given fluent quantity; we can do little more than lay down a few rules for such forms of fluxions as are known from the direct method, to belong to such and such kinds of fluents or flowing quantities; and these rules, it is evident, must chiefly consist in performing such operations as are the reverse of those by which the fluxions are found to given flowing quantities. The principal cases of which are as follow:

I. *To find the fluent of a simple fluxion; or that in which there is no variable quantity, and only one fluxional quantity.*—This is done by barely substituting the variable or flowing quantity instead of its fluxion, and is the result or reverse of the notation only. Thus,

The fluent of $a\dot{x}$ is ax.

The fluent of $a\dot{y} + 2\dot{y}$ is $ay + 2y$.

The fluent of $\sqrt{\dot{a^2}+\dot{x^2}}$ is $\sqrt{a^2+x^2}$.

II. *When any power of a flowing quantity is multiplied by the fluxion of the root.*—Then, having substituted, as before, the flowing quantity for its fluxion, divide the result by the new index of the power. Or, which is the same thing, take out, or divide by, the fluxion of the root; add 1 to the index of the power, and divide by the index so increased.

So if the fluxion proposed be $3x^5\dot{x}$;
Strike out $\dot{x}$ then it is $3x^5$;
add 1 to the index, and it is $3x^6$;
divide by the index 6, and it is $\frac{3}{6}x^6$ or $\frac{1}{2}x^6$;
which is the fluent of the proposed fluxion $3x^5\dot{x}$.

In like manner, the fluent

of $4ax\dot{x}$ is $2ax^2$;

of $3x^{\frac{1}{2}}\dot{x}$ is $2x^{\frac{3}{2}}$;

of $ax^n\dot{x}$ is $\frac{a}{n+1}x^{n+1}$;

of $\frac{\dot{z}}{z^2}$ or $z^{-2}\dot{z}$ is $-z^{-1}$ or $\frac{-1}{z}$.

of $(a^3+z^3)^4 z^2\dot{z}$ is $\frac{1}{15}(a^3+z^3)^5$.

III. *When the root under a vinculum is a compound quantity; and the index of the part or factor without the vinculum increased by 1, is some multiple of that under the vinculum.*—Put a single variable letter for the compound root: and substitute its powers and fluxion instead of those, of the same value, in the given quantity; so will it be reduced to a simpler form, to which the preceding rule can then be applied.

So, if the given fluxion be $\dot{F} = (a^2+x^2)^{\frac{2}{3}}x^3\dot{x}$; where 3, the index of the quantity without the vinculum, increased by 1, makes 4, which is double of 2, the exponent of x^2 within the same; therefore putting $z = a^2+x^2$, thence $x^2 = z - a^2$, and its fluxion is $2x\dot{x} = \dot{z}$; hence then $x^3\dot{x} = \frac{1}{2}x^2\dot{z} = \frac{1}{2}\dot{z}(z-a^2)$, and the given quantity $\dot{F}$ or $(a^2+x^2)^{\frac{2}{3}}x^3\dot{x}$ is $= \frac{1}{2}z^{\frac{2}{3}}\dot{z}(z-a^2)$ or $= \frac{1}{2}z^{\frac{5}{3}}\dot{z} - \frac{1}{2}a^2 z^{\frac{2}{3}}\dot{z}$; and the fluent of each term gives

$F = \frac{3}{16}z^{\frac{8}{3}} - \frac{3}{10}a^2 z^{\frac{5}{3}} = 3z^{\frac{5}{3}}(\frac{1}{16}z - \frac{1}{10}a)$; or, by substituting the value of z instead of it, the same fluent is $3(a^2+x^2)^{\frac{5}{3}} \times (\frac{1}{16}x^2 - \frac{3}{80}a^2)$, or $\frac{3}{16}\overline{a^2+x^2}|^{\frac{5}{3}}\ \overline{x^2 - \frac{3}{5}a^2}$.

IV. *When there are several terms involving two or more variable quantities, having the fluxion of each multiplied by the other quantity or quantities.*—Take the fluent of each term, as if there was only one variable quantity in it, namely that whose fluxion is contained in it, supposing all the others to be constant in that term; then if the fluents of all the terms so found be the very same quantity, that quantity will be the fluent of the whole.

Thus, if the given fluxion be $\dot{x}y + x\dot{y}$. Then, the fluent of $\dot{x}y$ is xy, supposing y constant; and the fluent of $x\dot{y}$ is also xy, when x is constant; therefore the common resulting quantity xy is the required fluent of the given fluxion $\dot{x}y + x\dot{y}$.

And in like manner the fluent of

$\dot{x}yz + x\dot{y}z + xy\dot{z}$ is xyz.

V. *When the given fluxional expression is in the form $\frac{\dot{x}y - x\dot{y}}{y^2}$, viz. a fraction including two quantities, being the fluxion of the former drawn into the latter, minus the fluxion of the latter drawn into the former, and divided by the square of the latter:* then the fluent is the fraction $\frac{x}{y}$, or of the former quantity divided by the latter. That is,

the fluent of $\frac{\dot{x}y - x\dot{y}}{y}$ is $\frac{x}{yz}$;

and the fluent of $\frac{2x\dot{x}y^2 - 2x^2y\dot{y}}{y^4}$ is $\frac{x^2}{y^2}$.

Though the examples of this case may be performed by the foregoing one. Thus the given fluxion

$\frac{\dot{x}y - x\dot{y}}{y^2}$ reduces to $\frac{\dot{x}}{y} - \frac{x\dot{y}}{y^2}$ or $\frac{\dot{x}}{y}$ or $x\dot{y}y^{-2}$; of which the fluent of $\frac{\dot{x}}{y}$ is $\frac{x}{y}$ when y is constant; and the fluent of $x\dot{y}y^{-2}$ is $+xy^{-1}$ or $\frac{x}{y}$ when x is constant; and therefore, by that case, $\frac{x}{y}$ is the fluent of the whole $\frac{\dot{x}y - x\dot{y}}{y^2}$.

VI. *When the fluxion of a quantity is divided by the quantity itself.*—Then the fluent is equal to the hyperbolic logarithm of that quantity; or, which is the same thing, the fluent is equal to 2·30258509, &c. multiplied by the common log. of the same quantity.

Thus the fluent

of $\frac{\dot{x}}{x}$ or $x^{-1}\dot{x}$, is the hyp. log. of x;

of $\frac{2\dot{x}}{x}$, is $2 \times$ hyp. log. of x, or hyp. log. of x^2;

of $\frac{\dot{x}}{a+x}$, is the hyp. log. of $a+x$;

of $\frac{3x^2\dot{x}}{a+x^3}$, is the hyp. log. of $a+x^3$;

of $\frac{\dot{x}}{\sqrt{x^2 \pm a^2}}$, is hyp. log. of $(x+\sqrt{x^2 \pm a^2})$;

of $\frac{\dot{x}}{\sqrt{x^2 \pm 2ax}}$, is hyp. log. $(x \pm a + \sqrt{x^2 \pm 2ax})$;

of $\frac{2a\dot{x}}{a^2-x^2}$, hyp. log. of $\frac{a+x}{a-x}$;

of $\frac{2a\dot{x}}{x\sqrt{a^2 \pm x^2}}$, is hyp. log. of $\frac{a-\sqrt{a^2 \pm x^2}}{a+\sqrt{a^2 \pm x^2}}$.

VII. *Many fluents may be found by the direct method of fluxions, thus.*—Take the fluxion again of the given fluxional expression, or the 2d fluxion of the fluent sought; into which substitute $\frac{\dot{x}^2}{x}$ for $\ddot{x}$ and $\frac{\dot{y}^2}{y}$ for $\ddot{y}$, &c. that is, make x, $\dot{x}$, $\ddot{x}$, as also y, $\dot{y}$, $\ddot{y}$, &c. in continual proportion. Then divide the square of the given fluxional expression by the 2d fluxion, just found, and the quotient will be the fluent sought in many cases.

Or the same rule may be delivered thus. In the given fluxion $\dot{F}$ write x for $\dot{x}$, y for $\dot{y}$, &c. and call the result G, taking also the fluxion of this quantity, $\dot{G}$; then make $\dot{G} : \dot{F} :: G : F$, so shall the fourth proportional F be the fluent, as before. This is the rule of M. Paccassi.

It may be proved whether this be the true fluent, by taking the fluxion of it again, which, if it agree with the proposed fluxion, will shew that the fluent is right; otherwise, the method fails.

Thus, if it be proposed to find the fluent of $nx^{n-1}\dot{x}$. Here $\dot{F} = nx^{n-1}\dot{x}$; write first x for $\dot{x}$, and it is $nx^{n-1}x$ or $nx^n = G$; the fluxion of this is $\dot{G} = n^2x^{n-1}\dot{x}$; therefore $\dot{G} : \dot{F} :: G : F$ becomes $n^2x^{n-1}\dot{x} : nx^{n-1}\dot{x} :: nx^n : x^n = F$, the fluent sought.

For a 2d ex. suppose it be proposed to find the fluent of $\dot{x}y + x\dot{y}$. Here $F = \dot{x}y + x\dot{y}$; then, writing x for $\dot{x}$, and y for $\dot{y}$, it is $xy + xy$ or $2xy = G$; the fluxion of which is $2\dot{x}y + 2x\dot{y} = \dot{G}$; then $\dot{G} : \dot{F} :: G : F$ becomes $2\dot{x}y + 2x\dot{y} : \dot{x}y + x\dot{y} :: 2xy : xy = F$, the fluent sought.

VIII. But fluents are more generally found by means of a table of forms of fluxions and fluents, in which comparing any proposed fluxion with a corresponding form given in the table, the fluent of it will be found. A very useful table of this kind is inserted under the article FLUENT in Dr. Hutton's Math. Dictionary, and illustrated by examples. But the most comprehensive table of this kind is from Cotes's Harmonia Mensurarum, and given in Emerson's Fluxions; its use has been amply shewn by Holliday and succeeding writers.

IX. *To find fluents by means of infinite series.*—When a finite form cannot be found to agree with a proposed fluxion, it is then usual to throw it into an infinite series, either by division, or extraction of roots, or by the binomial theorem, &c. after which the fluents of all the terms are taken separately.

For ex. To find the fluent of $\frac{1-x}{1+x-x^2}\dot{x}$.

Here, by dividing the numerator by the denominator, this becomes $\dot{x} - 2x\dot{x} + 3x^2\dot{x} - 5x^3\dot{x} + 8x^4\dot{x}$, &c.; and the fluents of all the terms being taken, give $x - x^2 + x^3 - \frac{5}{4}x^4 + \frac{8}{5}x^5$, &c., for the fluent sought.

Some excellent examples of this method may be seen in Simpson's Fluxions, vol. i.

To correct a Fluent.—The fluent of a given fluxion, found as above, sometimes wants a correction, to make it contemporary with that required by the problem under consideration, &c.: for the fluent of any given fluxion, as $\dot{x}$, may be either x (which is found by the rule) or it may be $x \pm c$, that is x plus or minus some constant quantity c; because both x and $x \pm c$ have the same fluxion $\dot{x}$: and the finding of the constant quantity, is called correcting the fluent. Now this correction is to be determined from the nature of the problem in hand, by which we come to know the relation which the fluent quantities have to each other at some certain point or time. Reduce therefore the general fluential equation, found by the rules above, to that point or time; then if the equation be true at that point, it is correct; but if not, it wants a correction, and the quantity of that correction is the difference between the two general sides of the equation when reduced to that particular state. Hence the general rule for the correction is this:

Connect the constant, but indeterminate, quantity c with one side of the fluential equation, as determined by the foregoing rules; then, in this equation, substitute for the variable quantities such values as they are known to have at any particular state, place, or time; and then from that particular state of the equation find the value of c, the constant quantity of the correction.

Ex. To find the correct fluent of $\dot{z} = ax^3\dot{x}$. First

the general fluent of this is $z=ax^4$, or $z=ax^4+c$, taking in the correction c.

Now if it be known that z and x begin together, or that $z=0$, when $x=0$; then writing 0 both for x and z, the general equation becomes $0=0+c$, or $c=0$; so that the value of c being 0, the correct fluents are $z=ax^4$.

But if z be $=0$, when x is $=b$, any known quantity; then substituting 0 for z, and b for x, in the general equation, it becomes $0 = ab^4 + c$, from which is found $c=-ab^4$; and this being written for it in the general equation, this becomes $z=ax^4-ab^4$, for the correct or contemporary fluents

Or lastly, if it be known that z is = some quantity d, when x is equal some other quantity, as b; then substituting d for z, and b for x, in the general fluential equation $z=ax^4+c$, it becomes $d=ab^4+c$; and hence is deduced the value of the correction, viz. $c = d - ab^4$; consequently, writing this value for c in the general equation, it becomes $z=ax^4-ab^4+d$, for the correct equation of the fluents in this case.

And hence arises another easy and general way of correcting the fluents, which is this: In the general equation of the fluents, write the particular values of the quantities which they are known to have at any certain time; then subtract the sides of the resulting particular equation, from the corresponding sides of the general one, and the remainders will give the correct equation of the fluents sought. So, as above,

the general equation being - $z=ax^4$;
write d for z, and b for x, then - $d=ab^4$;
hence by subtraction - $z-d=ax^4-ab^4$,
or $z=ax^4-ab^4+d$,

the correct fluents as before. (*Hutton's Dict*)

As this is a very important part of the doctrine of fluxions, it may be as well to illustrate it a little farther. Let us demand, therefore, the area of a parabola, commencing not at the summit A, but at the point B (fig. 11. Pl. 68.), taken upon the axis at any distance whatever from that summit. Here, then, the abscissa BP being represented by x, the distance AB from the vertex by a, and the parameter by p, we have for the equation of the curve, $y=\sqrt{pa+px}=$ PQ; and the fluxion of the area will be $y\dot{x}=\dot{x}\sqrt{pa+px}$: the fluent of this found by the usual methods will be

$$\frac{\frac{2}{3}\overline{pa+px}\sqrt{pa+px}}{p}=\tfrac{2}{3}(a+x)\sqrt{pa+px}=$$

$\frac{2}{3}$ AP · PQ. Now, it is evident that the area required should be nothing, when x or BP becomes nothing The area above is therefore too great by the area ABC; and this area ABC is found by making $x=0$ in the above expression; for it then becomes $\frac{2}{3}a\sqrt{pa}=\frac{2}{3}$AB·BC. Whence we see that to apply this correction to the fluent, it is requisite to know what it becomes when x is made equal to nothing; and if the result be positive, it must be subtracted; but if it be negative it must be added: for in the former case the fluent is too great, and in the latter it is too little.

There are cases also where by the conditions of the problem, we know that the fluent ought to be equal to nothing when the abscissa or x, instead of being 0, is of a determinate magnitude as a. It is then requisite to suppose x in the fluent equal to a; and if the result is positive to subtract it from the fluent, since it is too great; and, on the contrary, to add it if the result is negative, since it is too little. This would have happened if, in the preceding problem, the abscissa AP had been supposed equal to x, while we only required the magnitude of the segment CBPQ. For we should find the fluxion of this area $=\dot{x}\sqrt{px}$, and its fluent $=\frac{2}{3}x\sqrt{px}$. But this expression is that of the total area APQ, and the area demanded should vanish when AP=AB. We must therefore suppose $x=a$, and the preceding fluent becomes reduced to $\frac{2}{3}a\sqrt{pa}$, which being deducted from the former expression, will give for the true value of the area sought, $\frac{2}{3}x\sqrt{px}-\frac{2}{3}a\sqrt{pa}$.

A sketch of the principles of fluxions being now delivered, we may next say a little respecting the chief writings and improvements that have been made by divers authors, since the first discovery of them: indeed some of the chief improvements may be learned by consulting the preface to Dr. Waring's Meditationes Analyticæ.

The inventor himself brought the doctrine of fluxions to a considerable degree of perfection; as may be seen by many specimens of this science, given by him; particularly in his Principia, in his Tract on Quadratures, and in his Treatise on Fluxions, published by Mr. Colson; from all of which it will appear, that he not only laid down the whole theory of this method, both direct and inverse; but also applied it in practice to the solution of many of the most useful and important problems in mathematics and philosophy.

Various improvements however have been made by many illustrious authors on this science; particularly by John Bernoulli, who treated of the fluents belonging to the fluxions of exponential expressions; James Bernoulli, Craig, Cheyne, Cotes, Manfredi, Riccati, Taylor, Fagnanus, Clairaut, D'Alembert, Euler, Condorcet, Walmesley, Le Grange, Emerson, Simpson, Landen, Waring, Bezout, Bossut, Lacroix, &c. There are several other treatises also on the principles of Fluxions, by Hayes, Newyentyt, L'Hôpital, Hodgson, Rowe, Vince, &c. &c., delivering the elements of this science in an easy and familiar manner.

The elements of the doctrine of fluxions have been delivered by its great author in so concise a manner, as to give occasion to the most ingenious bishop Berkeley to represent it as founded on inconceivable principles, and full of false reasonings. This author, in a letter under the title of the Analyst, published in the year 1734, has been at great pains to convince his readers, that the objects, principles, and inferences of the modern analysis by fluxions, are not more distinctly conceived, or more evidently deduced, than religious mysteries and points of faith. He says he does not controvert the truth of the conclusions, but only the logic and method of mathematicians. An answer to the objections of the Analyst appeared very early under the name of Philalethes Cantabrigiensis, since known to be Dr. Jurin. And various others were published on the same side of the question. But the most able defences of the doctrine of fluxions were made by Mr. Robins (see his Tracts, vol. ii.) and by Mr. Maclaurin, in his very elaborate and excellent Treatise on Fluxions. The demonstrations of these two gentlemen are, we think, sufficient to satisfy the most scrupulous: to them, therefore, we with pleasure refer. Mr. Woodhouse, who, in his Principles of Analytical Calculation, has revived many of Berkeley's objections with greater mathematical talent, but with less metaphysical acuteness, says, the prolixity of the reasonings of Maclaurin and Robins "confirm the notion that the

method they defend is an incommodious one." This remark we think uncandid: the prolixity is occasioned not by want of simplicity in the method they defend, but by the tortuous intricacy and obscurity of many of the objections, which required much time to be pursued throughout, and, as several of them were subtile and specious, much labour and room to refute them completely. With regard to the comparative perspicuity of the two methods of establishing the principles, from the doctrine of motion and from pure analysis, we cannot hesitate to say that the former has the preference: and we are convinced that every unbiassed reader of the treatises of Maclaurin and Simpson on the one hand, and of Bossut and Lacroix on the other, will agree with us in opinion. Yet, we are constrained to acknowledge, notwithstanding this, that the principal improvements and extensions of the modern analysis, during the last forty years, have been made by continental, not by British, mathematicians.

For the various applications of fluxions to practical purposes, see the articles ASYMPTOTE, INFLEXION, MAXIMA, TANGENT, &c.

To FLY. *v. n.* pret. *flew* or *fled*; part. *fled* or *flown*: *fled* is properly from *flee*. (ꝼleoȝan.) 1. To move through the air with wings (*Shakspeare*). 2. To pass through the air (*Job*). 3. To pass away (*Prior*). 4. To pass swiftly (*Pope*). 5. To move with rapidity (*Dryden*). 6. To part with violence (*Shakspeare*). 7. To break; to shiver; to burst asunder with a sudden explosion (*Swift*). 8. To run away; to flee (*Prior*). 9. *To* FLY *at.* To spring with violence upon; to fall on suddenly (*South*). 10. *To* FLY *in the face.* To insult (*Swift*). 11. *To* FLY *in the face.* To act in defiance. 12. *To* FLY *off.* To revolt (*Addison*). 13. *To* FLY *out.* To burst into passion (*Ben Jonson*). 14. *To* FLY *out.* To break out into licence. 15. *To* FLY *out.* To start violently from any direction (*Bentley*). 16. *To let* FLY. To discharge (*Glanville*).

To FLY. *v. a.* 1. To shun; to avoid; to decline (*Shakspeare*). 2. To refuse association with (*Dryden*). 3. To quit by flight (*Dryden*). 4. To attack by a bird of prey (*Bacon*).

FLY, in entomology. See MUSCA.

FLY (Honeysuckle), in botany. See LONICERA.

FLY (Honeysuckle), African. See HALLERIA.

FLY-CATCHER, in ornithology. See MUSCICAPA.

FLY (Spanish). See CANTHARIDES.

FLY-TRAP (Venus's), See DIONÆA.

FLY THE HEELS, in the manage, is when a horse obeys the spurs.

FLY (Vegetable), a very curious natural production, chiefly found in the West Indies, and thus improperly denominated. Excepting that it has no wings, it resembles the drone both in size and colour more than any other British insect. In the month of May it buries itself in the earth, and begins to vegetate. By the latter end of July, the tree is arrived at its full growth, and resembles a coral branch; and is about three inches high, and bears several little pods, which dropping off become worms, and thence flies, like the British caterpillar. Such was the account originally given of this extraordinary production. But several boxes of these flies having been sent to Dr. Hill for examination, his report was this: "There is in Martinique a fungus of the clavaria kind, different in species from those hitherto known. It produces soboles from its sides; I call it, therefore, clavaria sobolifera. It grows on putrid animal bodies, as our fungus ex pede equino from the dead horse's hoof. The cicada is common in Martinique, and in its nympha state, in which the old authors call it tettigometra; it buries itself under dead leaves to wait its change; and, when the season is unfavourable, many perish. The seeds of the clavaria find a proper bed in this dead insect, and grow. The tettigometra is among the cicadæ in the British museum; the clavaria is just now known. This is the fact, and all the fact; though the untaught inhabitants suppose a fly to vegetate, and though there is a Spanish drawing of the plants growing into a trifoliate tree, and it has been figured with the creature flying with this tree upon its back." Edwards has taken notice of this extraordinary production in his Gleanings of Natural Hisrtoy.

FLY, in mechanics, is a name given to a certain appendage to many machines, either as a *regulator* of their motions, or as a *collector* of power. In the first case the fly is a heavy disk or hoop, or other mass of matter balanced on its axis, and so connected with the machinery as to turn briskly round with it. This may be done with the view of rendering the motion of the whole more regular, notwithstanding unavoidable inequalities of the accelerating forces, or of the resistances occasioned by the work. It becomes a REGULATOR. Suppose the resistance extremely unequal, and the impelling power perfectly constant; as when a bucket wheel is employed to work one pump. When the piston has ended its working stroke, and while it is going down the barrel, the power of the wheel being scarcely opposed, it accelerates the whole machine, and the piston arrives at the bottom of the barrel with a considerable velocity. But in the rising again, the wheel is opposed by the column of water now pressing on the piston. This immediately retards the wheel; and when the piston has reached the top of the barrel, all the acceleration is undone, and is to begin again. The motion of such a machine is very hobbling: but the superplus of accelerating force at the beginning of a returning stroke will not make such a change in the motion of the machine if we connect the fly with it. For the accelerating momentum is a determinate quantity. Therefore, if the radius of the fly be great, this momentum will be attained by communicating a small angular motion to the machine. The momentum of the fly is as the square of its radius; therefore it resists acceleration in this proportion; and although the overplus of power generates the same momentum of rotation in the whole machine as before, it makes but a small addition to its velocity. If the diameter of the fly be doubled, the augmentation of rotation will be reduced to one-fourth. Thus, by giving a rapid motion to a small quantity of matter, the great acceleration, during the returning stroke of the piston, is prevented. This acceleration continues, however,

during the whole of the returning stroke, and at the end of it the machine has acquired its greatest velocity. Now the working stroke begins, and the overplus of power is at an end. The machine accelerates no more; but if the power is just in equilibrio with the resistance, it keeps the velocity which it has acquired, and is still more accelerated during the next returning stroke. But now, at the beginning of the subsequent working stroke, there is an overplus of resistance, and a retardation begins, and continues during the whole rise of the piston; but it is considerable in comparison of what it would have been without the fly; for the fly, retaining its acquired momentum, drags forward the rest of the machine, aiding the impelling power of the wheel. It does this by all the communications taking into each other in the opposite direction. The teeth of the intervening wheels are heard to drop from their former contact on one side, to a contact on the other. By considering this process with attention, we easily perceive that, in a few strokes, the overplus of power during the returning stroke comes to be so adjusted to the deficiency during the working stroke, that the accelerations and retardations exactly destroy each other, and every succeeding stroke is made with the same velocity, and an equal number of strokes is made in every succeeding minute. Thus the machine acquires a general uniformity with periodical inequalities. It is plain, that by sufficiently enlarging either the diameter or the weight of the fly, the irregularity of the motion may be rendered as small as we please. It is much better to enlarge the diameter. This preserves the friction more moderate, and the pivot wears less. For these reasons, a fly is in general a considerable improvement in machinery, by equalising many exertions that are naturally very irregular. Thus, a man working at a common windlass exerts a very irregular pressure on the winch. In one of his positions in each turn he can exert a force of near 70 pounds without fatigue, but in another he cannot exert above 25; nor must he be loaded with much above this in general. But if a large fly be connected properly with the windlass, he will act with equal ease and speed against 30 pounds.

This regulating power of the fly is without bounds, and may be used to render uniform a motion produced by the most desultory and irregular power. It is thus that the most regular motion is given to mills that are driven by a single-stroke steam engine, where for two or even three seconds there is no force pressing round the mill. The communication is made through a massive fly of very great diameter, whirling with great rapidity. As soon as the impulse ceases, the fly, continuing its motion, urges round the whole machinery with almost unabated speed. At this instant all the teeth, and all the joints, between the fly and the first mover, are heard to catch in the opposite direction.

If any permanent change should happen in the impelling power, or in the resistance, the fly makes no obstacle to its producing its full effect on the machine; and it will be observed to accelerate or retard uniformly, till a new general speed is acquired exactly corresponding with this new power and resistance.

Many machines include in their construction movements which are equivalent to this intentional regulator. A flour mill, for example, cannot be better regulated than by its millstone; but in the Albion mills, a heavy fly was added with great propriety; for if the mills had been regulated by their millstones only, then at every change of stroke in the steam engine, the whole train of communications between the beam, which is the first mover, and the regulating millstone, which is the very last mover, would take in the opposite direction. Although each drop in the teeth and joints be but a trifle, the whole, added together, would make a considerable jolt. This is avoided by a regulator immediately adjoining to the beam. This continually presses the working machinery in one direction. So judiciously were the movements of that noble machine contrived, and so nicely were they executed, that not the least noise was heard, nor the slightest tremor felt in the building.

Mr. Valoué's beautiful pile engine employed at Westminster Bridge is another remarkable instance of the regulating power of a fly. When the ram is dropped, and its follower disengaged immediately after it, the horses would instantly tumble down, because the load, against which they had been straining hard, is at once taken off; but the gin is connected with a very large fly, which checks any remarkable acceleration, allowing the horses to lean on it during the descent of the load; after which their draught recommences immediately. The spindles, cards, and bobbins, of a cotton mill, are also a sort of flies. Indeed all bulky machines of the rotative kind tend to preserve their motion with some degree of steadiness, and their great momentum of inertia is as useful in this respect as it is prejudicial to the acceleration or any reciprocation when wanted.

There is another kind of regulating fly, consisting of wings whirled briskly round till the resistance of the air prevents any great acceleration. This is a very bad one for a working machine, for it produces its effect by really wasting a part of the moving power. Frequently it employs a very great and unknown part of it, and robs the proprietor of much work. It should never be introduced into any machine employed in manufactures.

Some rare cases occur where a very different regulator is required: where a certain determined velocity is found necessary. In this case the machine is furnished, at its extreme mover, with a conical pendulum, consisting of two heavy balls hanging by rods, which move in very nice and steady joints at the top of a vertical axis. It is well known, that when this axis turns round, with an angular velocity suited to the length of those pendulums, the time of a revolution is determined. Thus, if the length of each pendulum be 39$\frac{1}{4}$ inches, the axis will make a revolution in two seconds very nearly. If we attempt to force it more swiftly round, the balls will recede a little from the axis, but it employs as long time for a revolution as before; and we cannot make it turn swifter, unless the impelling power be increased beyond all probability; in which case the pendulum will fly out from the centre till the rods are horizontal, after which every increase of power will accelerate the machine very sensibly. Watt and Boulton have applied this contrivance with great ingenuity to their steam engines, when they are employed for driving machinery for manufactures which have a very changeable resistance, and where a certain speed cannot be much departed from without great inconvenience. They have connected this recess of the balls from the

axis (which gives immediate indication of an increase of power or a diminution of resistance) with the cock which admits the steam to the working cylinder. The balls flying out cause the cock to close a little, and diminish the supply of steam. The impelling power diminishes the next moment, and the balls again approach the axis, and the rotation goes on as before, although there may have occurred a very great excess or deficiency of power.

A fly is sometimes employed for a very different purpose from that of a regulator of motion—it is employed as a collector of power. Suppose all resistance removed from the working point of a machine furnished with a very large or heavy fly immediately connected with the working point. When a small force is applied to the impelled point of this machine, motion will begin in the machine, and the fly begin to turn. Continue to press uniformly, and the machine will accelerate. This may be continued till the fly has acquired a very rapid motion. If at this moment a resisting body be applied to the working point, it will be acted on with very great force; for the fly has now accumulated in its circumference a very great momentum. If a body were exposed immediately to the action of this circumference, it would be violently struck. Much more will it be so, if the body be exposed to the action of the working point, which perhaps makes one turn while the fly makes a hundred. It will exert a hundred times more force there (very nearly) than at its own circumference. All the motion which has been accumulated on the fly during the whole progress of its acceleration is exerted in an instant at the working point, multiplied by the momentum depending on the proportion of the parts of the machine. It is thus that the coining press performs its office; nay, it is thus that the blacksmith forges a bar of iron. Swinging the great sledge hammer round his head, and urging it with force the whole way, this accumulated motion is at once extinguished by impact on the iron. It is thus also we drive a nail, &c. This accumulating power of a fly has occasioned many to imagine that a fly really adds power or mechanical force to an engine; and, not understanding on what its efficacy depends, they often place the fly in a situation where it only adds a useless burden to the machine. It should always be made to move with rapidity. If intended for a mere regulator, it should be near the first mover: and if it be intended to accumulate force in the working point, it should not be far separated from it. In a certain sense, a fly may be said to add power to a machine, because by accumulating into the exertion of one moment the exertions of many, we can sometimes overcome an obstacle that we never could have balanced by the same machine unaided by the fly. And it is this accumulation of force which gives such an appearance of power to some of our first movers.

FLY, in the sea language, that part of the mariner's compass on which the several winds or points are drawn. "Let fly the sheet," is a word of command to let loose the sheet, in case of a gust of wind, lest the ship should overset, or spend her top-sails and masts; which is prevented by letting the sheet go a-main, that it may hold no wind.

To FLY'BLOW. *v. a.* (*fly* and *blow.*) To taint with flies; to fill with maggots (*Still.*).

FLY'BOAT. *s.* (*fly* and *boat.*) A kind of vessel nimble and light for sailing.

FLYCA'TCHER. *s.* (*fly* and *catch.*) One that hunts flies (*Dryden*).

FLY'ER. *s.* (from *fly.*) See FLIER. 1. One that flies or runs away (*Sandys*). 2. One that uses wings. 3. The fly of a jack.

FLYERS, in architecture, such stairs as go straight, and do not wind round, nor have the steps made tapering; but the ends, and the fore and back part of each stair, respectively parallel.

To FLY'FISH. *v. n.* (*fly* and *fish.*) To angle with a hook baited with a fly.

FLYING, the progressive motion of a bird, or other winged animal, in the liquid air. The parts of birds chiefly concerned in flying are the wings, by which they are sustained or wafted along. The tail, Messieurs Willoughby, Ray, and many others, imagine to be principally employed in steering and turning the body in the air, as a rudder: but Borelli has put it beyond all doubt, that this is the least use of it, which is chiefly to assist the bird in its ascent and descent in the air; and to obviate the vacillations of the body and wings: for, as to turning to this or that side, it is performed by the wings, and inclinations of the body, and but very little by the help of the tail. The flying of a bird, in effect, is quite a different thing from the rowing of a vessel. Birds do not vibrate their wings towards the tail, as oars are struck towards the stern, but waft them downwards: nor does the tail of the bird cut the air at right angles, as the rudder does the water; but is disposed horizontally, and preserves the same situation what way soever the bird turns.

In effect, as a vessel is turned about on its centre of gravity to the right, by a brisk application of the oars to the left, so a bird in beating the air with its right wing alone, towards the tail, will turn its fore part to the left. Thus pigeons, changing their course to the left, would labour it with their right wing, keeping the other almost at rest. Birds of a long neck alter their course by the inclinations of their head and neck, which altering the course of the line of gravity, the bird will proceed in a new direction.

The general mode of flying is this: the bird first bends his legs, and springs with a violent leap from the ground; then opens and expands the joints of his wings, so as to make a right line perpendicular to the sides of his body: thus the wings, with all the feathers therein, constitute one continued lamina. Being now raised a little above the horizon, and vibrating the wings with great force and velocity perpendicularly against the subject air, that fluid resists those succussions, both from its natural inactivity and elasticity, by means of which the whole body of the bird is protruded. The resistance the air makes to the withdrawing of the wings, and consequently the progress of the bird, will be so much the greater, as the waft or stroke of the fan of the wing is longer: but as the force of the wing is continually di-

minished by this resistance, when the two forces come to be in equilibrio, the bird will remain suspended in the same place: for the bird only ascends so long as the arch of air the wing describes makes a resistance equal to the excess of the specific gravity of the bird above the air. If the air, therefore, is so rare as to give way with the same velocity as it is struck with, there will be no resistance, and consequently the bird can never mount. Birds never fly upwards in a perpendicular line, but always in a parabola. In a direct ascent, the natural and artificial tendency would oppose and destroy each other, so that the progress would be very slow. In a direct descent they would aid one another, so that the fall would be too precipitate.

Flying-fish, in ichthyology. See Exocœtus.

Flying pinion, is part of a clock, having a fly or fan by which to gather air, and so bridle the rapidity of the clock's motion when the weight descends in the striking part.

FO. See Fe.

FOAL, the produce of a horse and mare in a general sense; though more usually applied to the colt or male produce; the female being commonly called a filly foal. It is said to be no difficult matter to know the shape that a foal is likely to be of when full grown; for the same shape that he carries at a month he will carry at six years old, if he be not abused in after keeping; and as the good shape, so will be the defects also. As to the height, it is observed, that a large shin-bone, long from the knee to the pastern, indicates a tall horse. Another way of judging is, to see what space he has between his knee and withers; which being doubled, it will be his height when he is a competent horse. There are also means to know the probable goodness of foals in a subsequent period; for if they be stirring, not apt to be frighted, active, and striving for mastery, some writers assert, they generally prove good mettled horses.

Foal-teeth. See the article Age.

To Foal. *v. a.* (from the noun.) To bring forth a foal (*May*).

FOAM. *s.* (ꝼam, Saxon.) The white substance which agitation or fermentation gathers on the top of liquors; froth; spume (*Hosea*).

To Foam. *v. n.* (from the noun.) 1. To froth; to gather foam (*Shakspeare*). 2. To be in rage; to be violently agitated (*Mark*).

FO'AMY. *a.* (from *foam.*) Covered with foam; frothy (*Sidney*).

FOB. *s.* (*fuppe,* German.) A small pocket (*Addison*).

To Fob. *v. a.* (*fuppen,* German.) 1. To cheat; to trick; to defraud (*Shakspeare*). 2. *To* Fob *off*. To shift off; to put aside with an artifice (*Addison*).

FO'CAL. *a.* (from *focus,* Latin.) Belonging to the focus (*Denham*).

Focal distance, the distance of the focus, which is sometimes understood as its distance from the vertex, as in the parabola; and sometimes its distance from the centre, as in the ellipse or hyperbola.

FO-CHAN, a village of China, in the province of Quangtong. It is called a village, because it has no walls nor a presiding governor, although it has a great trade, and contains more houses and inhabitants than Canton. It is reckoned to be nine miles in circumference, and to contain 1,000,000 inhabitants. It is 12 miles from Canton.

FOCHIA NOVA, a seaport of Natolia, with a good harbour, and a castle. It is seated on the gulf of Sanderly. Lat 38. 44 N. Lon. 26. 39 E.

FO'CIL. *s.* (*focile,* French.) The greater or less bone between the knee and ankle, or elbow and wrist (*Wiseman*).

FOCILLA'TION. *s.* (*focillo,* Lat.) Comfort; support.

FOCOSO, in music, with fire and spirit.

FOCUS, in geometry and the conic sections, is applied to certain points in the ellipse, hyperbola, and parabola, where the rays reflected from all parts of these curves do concur or meet; that is, rays issuing from a luminous point in the one focus, and falling on all points of the curves, are reflected into the other focus, or into the line directed to the other focus, viz. into the other focus in the ellipse and parabola, and directly from it in the hyperbola. Which is the reason of the name focus, or burning-point. Hence, as the one focus of the parabola is at an infinite distance; and consequently all rays drawn from it, to any finite part of the curve about the vertex, are parallel to one another; therefore if rays from the sun, or any other object so distant as that those rays may be accounted parallel, fall upon the curve of a parabola or concave surface of a paraboloidal figure, those rays will all be reflected into its focus.

In all the three curves the double ordinate drawn through the focus is the parameter of the axis, or a third proportional to the transverse and conjugate. If there be any tangent to these curves, and two lines drawn from the foci to the point of contact, these two lines will make equal angles with that tangent.

In the parabola, the distance from the focus to the vertex is equal to $\frac{1}{4}$ of the parameter, or $\frac{1}{2}$ the ordinate at the focus.

For other properties of the foci, see the different authors on Conics.

Focus, in optics, is a point in which several rays meet, and are collected, after being either reflected or refracted. It is so called, because the rays being here brought together and united, their force and effect are increased, insomuch as to be able to burn; and therefore it is that bodies are placed in this point to be burnt, or to shew the effect of burning glasses, or mirrors. It is to be observed, however, that in practice, the focus is not an absolute point, but a space of some small breadth, over which the rays are scattered; owing to the different nature and refrangibility of the rays of light and to the imperfections in the

figure of the lens, &c. However, the smaller this space is, the better, or the nearer to perfection the machine approaches. Huygens shews that the focus of a lens convex on both sides, has its breadth equal to $\frac{4}{9}$ of the thickness of the lens.

Virtual Focus, or Point of Divergence, so called by Mr. Molyneux, is the point from whence rays tend, after refraction or reflection; being in this respect opposed to the ordinary focus, or point of concurrence, where rays are made to meet after refraction or reflection. Thus, the foci of an hyperbola are mutually virtual foci to each other: but, in an ellipse, they are common foci to each other: for the rays are reflected from the other focus in the hyperbola, but towards it in the ellipse.

Practical Rules for finding the Foci of Glasses.

1. To find, by experiment, the focus of a convex spherical glass, being of a small sphere; apply it to the end of a scale of inches and decimal parts, and expose it before the sun; upon the scale may be seen the bright intersection of the rays measured out: or, expose it in the hole of a dark chamber; and where a white paper receives the distinct representation of distant objects, there is the focus of the glass. 2. For a glass of a pretty long focus, observe some distant object through it, and recede from the glass till the eye perceives all in confusion, or the object begins to appear inverted; then the eye is in the focus. 3. For a plano-convex glass: make it reflect the sun against the wall; on the wall will then be seen two sorts of light, a brighter within another more obscure: withdraw the glass from the wall, till the bright image be in its least dimensions; then is the glass distant from the wall about a fourth part of its focal length. 4. For a double convex: expose each side to the sun in like manner; and observe both the distances of the glass from the wall: then is the first distance about half the radius of the convexity turned from the sun; and the second is about half the radius of the other convexity. The radii of the two convexities being thus known, the focus is then found by this rule; As the sum of the radii of both convexities : is to the radius of either convexity : : so is double the radius of the other convexity : to the distance of the focus.

Dr. Halley gave general methods of finding the foci of all kinds of glasses, both geometrically and algebraically. See Phil. Trans. No. 205, &c. The same is also shewn by the principal writers on optics; as by Emerson, Martin, Smith, Wood, &c. See also our articles Catoptrics and Dioptrics.

FO'DDER. *s.* (ꝼoðꞃe, ꝼoðeꞃ, Saxon.) Dry food stored up for cattle against winter (*Knolles*).

To Fo'dder. *v. a.* (from the noun.) To feed with dry food (*Evelyn*).

FO'DDERER. *s.* He who fodders cattle.

FODWAR, a town of Hungary. Lat. 46. 39 N. Lon. 19. 36 E.

FOE. *s.* (ꝼah, Saxon.) 1. An enemy in war (*Spenser*). 2. A persecutor; an enemy in common life. 3. An opponent; an ill wisher (*Watts*).

FO'EMAN. *s.* (from *foe* and *man.*) Enemy in war; antagonist: obsolete (*Spenser*).

FŒNI'CULUM. (*fœniculum, quasi fœnum osulorum,* the hay or herb good for the sight; so called because it is thought good for the eyes.) Fennel. See Anethum.

Fœniculum aquaticum. Water fennel. Fine-leaved water hemlock. The plant which bears this name in the pharmacopœias is the phellandrium aquaticum; foliorum ramificationibus divaricatis, of Linnéus. It possesses vertiginous and poisonous qualities, which are best counteracted by acids, after clearing the primæ viæ. The seeds are recommended by some, in conjunction with peruvian bark, in the cure of pulmonary phthisis. See Phellandrium.

Fœniculum dulce. Common fennel. Anethum fœniculum fructibus ovatis of Linnéus. Class pentandria. Order digynia. The seeds and roots of this indeginous plant are directed by the colleges of London and Edinburgh. The seeds have an aromatic smell, and a warm sweetish taste, and contain a large proportion of essential oil. They are stomachic and carminative. The root has a sweet taste, but very little aromatic warmth, and is said to be pectoral and diuretic.

Fœniculum porcinum. See Peucedanum and Anethum.

Fœniculum vulgare. Common fennel or fenckle. A variety of the anethum fœniculum. See Fœniculum dulce.

FŒNUGREEK, in botany. See Trigonella.

FŒNUM GRÆCUM. (*fœnum,* hay, and *græcus,* belonging to Greece, because in Greece it grew in the meadows like hay.) Fenugreek. Trigonella fœnum græcum leguminibus sessilibus strictis erectiusculis subfalcatis acuminatis, caule erecto, of Linnéus. Diadelphia. Decandria. A native of Montpelier. The seeds are brought to us from the southern parts of France and Germany; they have a strong disagreeable smell, and an unctuous farinaceous taste, accompanied with a slight bitterness. They are esteemed as assisting the formation of pus in inflammatory tumours; and the meal, with that intention, is made into a poultice with milk; though the meal of linseed is at present more frequently resorted to, as a better emollient and sedative.

Fœnum camelorum. See Juncus odoratus.

FŒTIDIA. In botany, a genus of the class icosandria, order monogynia. Calyx superior, four-cleft; corolless; capsule woody, four-celled; the cells one or two-seeded. A tree of Mauritius, with one-flowered terminal peduncles.

FŒTUS. (*fœtus.*) The child enclosed in the uterus of its mother is called a fœtus from the fifth month after pregnancy until the time of its birth. This term should rather be spelt fetus, as derived from the old Latin *feo,* whence *fio,* and is so spelt by all the old

Roman writers. From the same root we obtain *fecundus, femen, femina.* The internal parts peculiar to the fœtus are the thymus *gland, canalis venosus, canalis arteriosus, foramen ovale, and the membrana pupillaris.* Besides these peculiarities, there are other circumstances in which the fœtus differs from the adult. The lungs are black and collapsed, and sink in water; the liver is very large; all the glands, especially the thymus and suprarenal, and the vermiform process of the cæcum, are also considerably larger in proportion. The teeth of the fœtus are hid within their sockets; the great intestines contain a substance called meconium; the membrana tympani is covered with a kind of mucous membrane, and the bones in many places are cartilaginous.

FOG, or MIST, a meteor, consisting of gross vapours, floating near the surface of the earth. Mists, according to lord Bacon, are imperfect condensations of the air, consisting of a large proportion of the air, and a small one of the aqueous vapour: and these happen in the winter, about the change of the weather from frost to thaw, or from thaw to frost; but in the summer, and in the spring, from the expansion of the dew. If the vapours, which are raised plentifully from the earth and waters, either by the solar or subterraneous heat, do at their first entrance into the atmosphere meet with cold enough to condense them to a considerable degree, their specific gravity is by that means increased, and so they will be stopped from ascending; and either return back in form of dew or of drizzling rain, or remain suspended some time in the form of a fog. Vapours may be seen on the high grounds as well as the low, but more especially about marshy places. They are easily dissipated by the wind, as also by the heat of the sun. They continue longest in the lowest grounds, because those places contain most moisture, and are least exposed to the action of the wind. Hence we may easily conceive, that fogs are only low clouds, or clouds in the lowest region of the air; as clouds are no other than fogs raised on high. (See CLOUD.) When fogs stink, then the vapours are mixed with sulphureous and offensive exhalations. Objects viewed through fogs appear larger and more remote than through the common air. Mr. Boyle observes that, upon the coast of Coromandel, and most maritime parts of the East Indies, there are, notwithstanding the heat of the climate, annual fogs, so thick, as to occasion people of other nations who reside there, and even the more tender sort of the natives, to keep their houses close shut up. Fogs are commonly pretty strongly electrified, as appears from Mr. Cavallo's experiments upon them.

FOG. *s.* (*fogagium*, low Latin.) Aftergrass.

FO'GGILY. *ad.* (from *foggy.*) Mistily; darkly; cloudily.

FO'GGINESS. *s.* (from *foggy.*) The state of being dark or misty; cloudiness; mistiness.

FO'GGY. *a.* (from *fog.*) 1. Misty; cloudy; dark (*Evelyn*). 2. Cloudy in understanding; dull.

FOGLIETA (Uberto), a Genoese priest, born in 1518. He was banished from his native country for the freedom of his writings. *He then retired to Rome, where he died in 1581. His principal works are,* 1. Historia Genuensium, 1585. 2. De Causa Magnitudinis Turcarum Imperii. 3. Della Republica di Genoa.

FOGO. See FUEGO.

FOH! An interjection of abhorrence.

FO-HI, the first Chinese monarch, who is said to have founded that kingdom 200 years after the deluge. He removed the seat of the empire from the province of Xen Si to Chin Cheu. To him the Chinese are indebted for musical instruments, a code of laws, the regulation of the sexual intercourse, which before him was promiscuous, and for religious observances. He is said to have reigned 115 years, but so much fable is blended with his story, that it is not proper to mention more concerning him.

FOI'BLE. *s.* (French.) A weak side; a blind side; a failing (*Freind*).

To FOIL. *v. a.* (*affoler*, old French.) 1. To put to the worst; to defeat (*Milton*). 2. (*fouiller*, French.) To blunt; to dull (*Shakspeare*). 3. To defeat; to puzzle (*Addison*).

FOIL. *s.* (from the verb.) 1. A defeat; a miscarriage (*Southern*). 2. Leaf gilding. (*feuille*, French.) (*Milton*). 3. Something of another colour near which jewels are set to raise their lustre (*Sidney*). 4. A blunt sword used in fencing (*Shakspeare*).

FOIL, a term used in hare hunting. When, during the chase, a hare, after a head or double, runs over the ground she has run before, she is then said to be running the foil, and with strict truth; as nothing can so much foil the hounds as a chase of this description. Old hares, who have speed enough to break away, and get considerably a-head, almost invariably throw themselves out to the right or left, double, and quat; particularly if a hedge-row, hedge, fern, furze, or any kind of covert presents itself favourably for the purpose. The hounds continuing to run the scent to the spot where she made her head, over-run the hare, and having no continuance of scent, are necessarily at fault; during which delay of trying forward, trying back, making a cast to the right, then a cast to the left, the hare slips into her foil; by which repeated runnings, she often obtains an escape she could obtain in no other way.

FO'ILER. *s.* (from *foil.*) One who has gained advantage over another.

To FOIN. *v. n.* (*foindre*, Fr. *Skinner.*) To push in fencing (*Dryden*).

FOIN. *s.* (from the verb.) A thrust; a push.

FO'ISON. *s.* (foiſon, Saxon.) Plenty; abundance: out of use (*Shakspeare*).

To FOIST. *v. a.* (*fausser*, French.) To insert by forgery (*Carew*).

FO'ISTINESS. *s.* (from *foisty.*) Fustiness; mouldiness (*Tusser*).

FO'ISTY. *a.* (See FUSTY.) Mouldy; fusty.

FOIX, a town of France, in the department of Arriege, at the foot of the Pyrenees. Lat. 43. 0 N. Lon. 1. 32 E.

FOKIEN, a province of China in Asia, *commodiously situated for navigation and commerce, part of it bordering on the sea, in* which they catch large quantities of fish, which they send salted to other parts of the empire. Its shores are very uneven, by reason of the number and variety of its bays; and there are many forts built thereon to guard the coast. The air is hot, but pure and wholesome. The mountains are almost every where disposed into a kind of amphitheatres, by the labour of the inhabitants, with terraces placed one above another. The fields are watered with rivers and springs, which issue out of the mountains, and which the husbandmen conduct in such a manner as to overflow the fields of rice when they please, because it thrives best in watery ground. They make use of pipes of bamboe for this purpose. The chief town is Foutcheou-Fou.

FOLARD (Charles), a French officer, born at Avignon, in 1669. In 1720 he became aid-du-camp to M. de Vendome, who undertook nothing without consulting him. For his great services he was rewarded with a pension, and the cross of St. Louis. He received a wound at the battle of Cassano, by which he was deprived of the use of his left hand. About 1710 he was made prisoner by prince Eugene, and on his being exchanged he was sent to Malta, to assist in its defence against the Turks. He afterwards served under Charles XII. of Sweden, and was present at the siege of Frederickshall, when that prince was killed in 1718. He then returned to France, and in 1719 served as colonel under the duke of Berwick. He died in 1752. He wrote as follows: 1. Commentaries upon Polybius, 6 vols. 4to. 2. A book of new Discoveries in War. 3. A Treatise on the Defence of Places.

FOLC-LANDS, the name given to copyhold lands, in the time of the Saxons.

FOLCMOTE, or FOLKMOTE, according to Kennet, was the common-council of all the inhabitants of a city, town, or borough; though Spelman will have the folkmote to have been a sort of annual parliament or convention of the bishops, thanes, aldermen, and freemen, on every May-day. Dr. Brady, on the contrary, tells us, that it was an inferior court, held before the king's reeve, or his steward, every month, to do folk right.

FOLD. *s.* (ꝼalꝺ, Saxon.) 1. The ground in which sheep are confined. 2. The place where sheep are housed (*Raleigh*). 3. The flock of sheep (*Dryden*). 4. A limit; a boundary (*Creech*). 5. A double; a complication; one part added to another. (from ꝼilꝺ, Saxon.) (*Arbuthnot*). 6. From the foregoing signification is derived the use of *fold* in composition. *Fold* signifies the same quantity added: as, *twenty-fold,* twenty times repeated (*Matthew*).

To FOLD. *v. a.* (from the noun.) 1. To shut sheep in the fold (*Milton*). 2. To enclose; to include; to shut (*Shakspeare*). 3. To double; to complicate (*Collier*).

To FOLD. *v. n.* To close over another of the same kind (*Kings*).

FOLIA, among botanists, particularly signify the leaves of plants; those of flowers being expressed by the word petals.

FOLIACEOUS SPIKE. In botany. A leafy spike. Having leaves intermixed with the flowers. Glandulæ foliaceæ. Leafy glands, or glands situated on the leaves. See GLAND.

FO'LIAGE. *s.* (*folium,* Latin.) Leaves; tufts of leaves (*Addison*). Representations of tufts or clusters of leaves.

FOLIATE, a name given by some to a curve of the second order, expressed by the equation $x^3+y^3=axy$, being one species of defective hyperbolas, with one asymptote, and consisting of two infinite legs crossing each other, forming a sort of leaf. It is the 42d species of Newton's Lines of the third order.

FOLIATE TENDRIL. In botany. A tendril placed on the leaf. Foliate gem. A leaf bud. Containing leaves, not flowers.

FOLIATE CAUL. In botany. A leafy stalk. In opposition to aphyllabus, leafless.

FOLIATING OF LOOKING-GLASSES, the spreading the plates over, after they are polished, with amalgam, in order to reflect the image. It is performed thus: a thin blotting paper is spread on the table, and sprinkled with fine chalk; and then a fine lamina or leaf of tin, called foil, is laid over the paper; upon this mercury is poured which is to be distributed equally over the leaf with a hare's foot, or cotton: over this is laid a clean paper, and over that the glass plate, which is pressed down with the right-hand, and the paper drawn gently out with the left: this being done, the plate is covered with a thicker paper, and loaden with a greater weight, that the superfluous mercury may be driven out, and the tin adhere more closely to the glass. When it is dried, the weight is removed, and the looking-glass is complete. Some add an ounce of marcasite, melted by the fire; and, lest the mercury should evaporate in smoke, pour it into cold water; and, when cooled, squeeze it through a cloth or through leather.

Some add a quarter of an ounce of tin and lead to the marcasite, that the glass may dry the sooner.

FOLIATING OF GLOBE LOOKING-GLASSES, is done as follows: Take five ounces of quicksilver, and one ounce of bismuth; of lead and tin half an ounce each: first put the lead and tin into fusion, then put in the bismuth, and when you perceive that in fusion too, let it stand till it is almost cold, and pour the quicksilver into it; after this, take the glass globe, which must be very clean, and the inside free from dust; make a paper funnel, which put into the hole of the globe, as near to the glass as you can, so that the amalgam, when you pour it in, may not splash, and cause

the glass to be full of spots; pour it in gently, *and move it about; so that the amalgam may touch every where. If you find the amalgam* begin to get curdly and fixed, then hold it over a gentle fire, and it will easily flow again. And if you find the amalgam too thin, add a little more lead, tin, and bismuth to it.' The finer and clearer your globe is, the better will the looking-glass be.

To FO'LIATE. *v. a.* (*foliatus*, Latin.) To beat into laminæ or leaves (*Newton*).

FOLIA'TION. *s.* (*foliatio*, Latin.) 1. The act of beating into thin leaves. 2. *Foliation* is one of the parts of a flower, being the collection of those fugacious coloured leaves called petals, which constitute the compass of the flower (*Quincy*).

FO'LIATURE. *s.* (from *folium*, Latin.) The state of being hammered into leaves.

FOLIGNI, an episcopal and trading town of Italy, in the duchy of Umbria. It is noted for its sweetmeats and paper-mills. Lat. 42. 48 N. Lon. 12. 24 E.

FO'LIO. *s.* (*in folio*, Latin.) A large book of which the pages are formed by a sheet of paper once doubled.

FOLIO, in merchants accounts, a page, or sometimes two; being so much of the ledger as contains both the debtor and creditor side of an account.

FO'LIOMORT. *a.* (*folium mortuum*, Lat.) A dark yellow; the colour of a leaf faded: vulgarly called *philomot* (*Woodward*).

FOLIS, or FOLLIS, anciently signified a little bag or purse; whence it came to be used for a sum of money, and very different sums were called by that name: thus, the scholiast on the Basilics mentions a follis of copper which was worth but the twenty-fourth part of the miliarensis; the glossæ nomicæ, quoted by Gronovius and others, out of a hundred and twenty-five miliarenses, and another of two hundred and fifty denarii, which was the ancient sestertium; and three different sums of eight, four, and two pounds of gold, were each called follis.

FOLIUM ORIENTALE, in medicine. See SENNA.

FOLK. *s.* (folc, Saxon.) 1. People, in familiar language (*Sidney*). 2. Nations; mankind (*Psalms*). 3. Any kind of people as discriminated from others (*Shakspeare*).

FOLKES (Martin), an English antiquary, mathematician, and philosopher, was born at Westminster about 1690; and was greatly distinguished as a member of the Royal Society in London, and of the Academy of Sciences at Paris. He was admitted into the former at 24 years of age; and made one of their council two years after; named by sir Isaac Newton himself as vice-president; and, after sir Hans Sloane, became president. There are numerous Memoirs of his in the Philosophical Transactions. Coins, ancient and modern, were a great object with him; and his last production was a book upon the English Silver Coin, from the conquest to his own times. He died at London in 1754. Dr. Birch had drawn up *materials for a life of Mr. Folkes, which are preserved at large in the Anecdotes of Bowyer*, p. 562 *et seq.*

FOLKSTONE, a town in Kent, with a market on Thursdays. It is a member of the port of Dover, governed by a mayor, and seated on the English Channel. Lat. 51. 5 N. Lon. 1. 14 E.

FOLLIA, a species of musical composition consisting of variations on a given air.

FOLLICLE. (from *follis*, a bag.) In botany. A univalvular pericarp, opening on one side longitudinally, and having the seeds loose in it. Pericarpium univalve latere altero longitudinaliter dehiscens, nec suturæ semina affigens. Exemplified in asclepias, apocynum, stapelia. See CONCEPTACLE.

In Philos. Botan. follicles (*folliculi*) are vessels distended with air: (air bags, with,) as at the root in utricularia, and on the leaves in aldrovanda.

FOLLICLE, in anatomy, a cell or little bag: it is generally applied to the cells of the cellular membrane, or of the simplest order of glands which (as the mucous) contain a single cavity and excreting duct.

FOLLICULOSE GLAND. One of the most simple species of gland, consisting merely of a hollow vascular membrane or follicle and an excretory duct; such are the muciparous glands, the sebaceous, &c.

To FOLLOW. *v. a.* (folȝian, Saxon.) 1. To go after; not before, or side by side. 2. To pursue as an enemy; to chase (*Dryden*). 3. To accompany; not to forsake (*Milton*). 4. To attend, as a dependant (*Pope*). 5. To go after, as a teacher (*Dryden*). 6. To succeed in order of time (*Pope*). 7. To be consequential in argument (*Milton*). 8. To imitate; to copy, as a pupil (*Hooker*). 9. To obey; to observe, as a guide (*Tillotson*). 10. To pursue as an object of desire (*Hebrews*). 11. To confirm by new endeavours (*Spenser*). 12. To attend to; to be busied with (*Ecclus*).

To FOLLOW. *v. n.* 1. To come after another (*Ben Jonson*). 2. To attend servilely (*Shakspeare*). 3. To be posterior in time. 4. To be consequential, as effect to cause. 5. To be consequential, as inference to premises (*Temple*). 6. To continue endeavours (*Hosea*).

FO'LLOWER. *s.* (from *follow*.) 1. One who comes after another; not before him, or side by side (*Shakspeare*). 2. One who observes a leader (*South*). 3. An attendant, or dependant (*Pope*). 4. An associate; a companion (*Shakspeare*). 5. One under the command of another (*Dryden*). 7. A scholar; an imitator; a copier (*Sprat*).

FO'LLY. *s.* (*folie*, French.) 1. Want of understanding; weakness of intellect (*Hawksworth*). 2. Criminal weakness; depravity of mind (*Shakspeare*). 3. Act of negligence or passion unbecoming gravity or deep wisdom (*Pope*).

FOMAHAUT, or FOMALHAUT, in astro-

nomy, a star of the first magnitude, marked α, in Piscis Australis.

To FOME'NT. *v. a.* (*fomentor*, Latin.) 1. To cherish with heat (*Milton*). 2. To bathe with warm lotions (*Arbuthnot*). 3. To encourage; to cherish (*Wotton*).

FOMENTATION. (*fomentatio.*) A sort of partial bathing, by applying hot flannels to any part dipped in medicated decoctions, whereby steams are communicated to the diseased parts, their vessels are relaxed, and their morbid action sometimes removed.

FOME'NTER. *s.* (from *foment.*) An encourager; a supporter.

FOMES, the plural of which is fomites, (from *foves*, to cherish.) The contagious or other miasm that produces or feeds and maturates a disease.

FON. *s.* A fool; an ideot: obsolete (*Spen.*).

FOND. *a.* 1. Foolish; silly; indiscreet; imprudent; injudicious (*Ascham*). 2. Trifling; valued by folly (*Shakspeare*). 3. Foolishly tender; injudiciously indulgent (*Addison*). 4. Pleased in too great a degree; foolishly delighted (*Prior*).

To FOND. *To* FO'NDLE. *v. a.* To treat with great indulgence; to caress; to cocker (*Dryden*).

To FOND. *v. n.* To be fond of; to be in love with; to dote on (*Shakspeare*).

FO'NDLER. *s.* (from *fond.*) One who fondles.

FO'NDLING. *s.* (from *fondle.*) A person or thing much fondled or caressed; something regarded with great affection (*Swift*).

FO'NDLY. *ad.* (from *fond.*) 1. Foolishly; weakly; imprudently (*Pope*). 2. With extreme tenderness (*Savage*).

FO'NDNESS. *s.* (from *fond.*) 1. Foolishness; weakness; want of sense; want of judgment (*Spenser*). 2. Foolish tenderness (*Addison*). 3. Tender passion (*Swift*). 4. Unreasonable liking (*Hammond*).

FONE. *s.* Plural of *foe*: obsolete (*Spenser*).

FONG-TSIANG-FOU, a city of China, in the province of Chen-si. Its district contains eight cities of the second and third class. It is 495 miles S.W. of Pekin.

FONG-YANG, a city of China, in the province of Kiang-Nan It is situated on a mountain, which hangs over the yellow river, and incloses with its walls several fertile little hills. Its jurisdiction is very extensive, for it comprehends 18 cities; 5 of which are of the second, and 13 of the third class.

FONS PULSATILIS. See FONTANELLA.

FONT, or BAPTISMAL FONT, a stone or marble vessel, at the lower end of a parish church, serving to hold water to be used in administering the sacrament of baptism.

FONT, in printing. See FOUNT.

FONTAINBLEAU, a town of France, in the department of Seine and Maine, remarkable for its fine palace; a hunting seat of the late kings of France. Lat 48. 25 N. Lon. 2. 47 E.

FONTAINE (John de la), the celebrated French poet, was born at Chateau-Thierry in 1621, and educated among the fathers of the oratory. He did not shew any marks of a poetical genius till he was past twenty. Some of his pieces introduced him to the notice of the duchess of Bouillon, whom he followed to Paris, where he obtained a pension. Madame de la Sabbliere gave him apartments in her house, and here he resided twenty years in habits of intimacy with the greatest wits of the age. He died in 1695. Besides his Tales, he also wrote Fables, in both of which he possesses all the merit of originality. Four volumes of his miscellaneous works were printed at Paris, in 1744.

Fontaine's character is remarkable for a simplicity, candour, and probity seldom to be met with. He was of an obliging disposition; cultivating a real friendship with his brother poets and authors; and, what is very rare, beloved and esteemed by them all. His conversation was neither gay nor brilliant, especially when he was not among his intimate friends. One day being invited to dinner at a farmer general's, he ate a great deal, but did not speak. Rising up from table very early, under pretext of going to the academy, one of the company represented to him that it was not yet a proper time: "Well," says he, "if it is not I will stay a little longer." He had one son by his wife in the year 1660. At the age of 14 he put him into the hands of M. de Harley, the first president, recommending to him his education and fortune. It is said, that having been a long time without seeing him, he happened to meet him one day visiting, without recollecting him again, and mentioned to the company that he thought that young man had a good deal of wit and understanding. When they told him it was his own son, he answered in the most tranquil manner, "Ha! truly I am glad on't."

FONTAINES (Peter Francis Guyot des), a French critic, born at Rouen in 1685. At fifteen he joined himself to the jesuits, but quitted them when he was thirty. In 1724 he succeeded the abbé Bignon in the management of the Journal des Savans. In 1731 he began a new work, called Nouveliste du Parnasse, ou Reflexions sur les Ouvrages nouveaux, which did not continue long. He started several other periodical publications, and died in 1745. He also translated several esteemed English books, and some of the Latin classics.

FONTANA (Domenico), an eminent architect and mechanic, born at Milan in 1543. He raised the Roman obelisk from the dust in the front of St. Peter's, a work deemed impracticable, and which many others had attempted in vain. He removed to Naples in 1592, and died there in 1607.

FONTANALIA, or FONTINALIA, in antiquity, a religious feast held among the Romans, in October, in honour of the deities who presided over fountains.

FONTANEL. *s.* (*fontanelle*, Fr.) An issue; a discharge opened in the body (*Wiseman*).

FONTA'NGE. *s.* A knot of ribands on the top of the headdress: out of use (*Addison*).

FONTANELLA, (*fontanella, of fons*, a fountain.) Fons pulsatilis. In anatomy. The parietal bones and the frontal bones do not coalesce until the third year, so that before this period there is an obvious interstice, commonly called mould, and scientifically the fontanel, or fons pulsatilis. There is also a smaller space, occasionally, between the occipital and parietal bones, termed the posterior fontanel. These spaces between the bones are filled up by the dura mater and the external integuments, so that, during birth, the size of the head may be lessened; for at that time the bones of the head, upon the superior part, are not only pressed nearer to, but frequently wrap over one another, in order to diminish the size during the passage of the head through the pelvis.

FONTANE'SIA, in botany, a genus of the class diandria, order monogynia. One species: a Syrian shrub with opposite branches; opposite, entire, lanceolate leaves, flowers yellowish in axillary corymbs.

FONTARABIA, a sea-port of Spain, in Biscay, well fortified both by nature and art. It has a good harbour, though dry at low water, and is surrounded on the land side by the Pyrenean mountains. Lat. 43. 23 N. Lon. 1. 33 W.

FONTENAI-LE-COMTE, a town of France, in the department of Vendee. It has a woollen manufacture, and a famous fair for cattle. Lat. 46. 30 N. Lon. 0. 55 W.

FONTENELLE (Bernard de), a celebrated French author, was born in 1657, and died in 1756, when he was near 100 years old. He discharged the trust of perpetual secretary to the Academy of Sciences above 40 years with universal applause; and his History of the Academy of Sciences throws a great light upon their memoirs, which are very obscure. The eloges which he pronounced on the deceased members of the academy have this peculiar merit, that they excite a respect for the sciences as well as for the author. In his poetical performances, and the Dialogues of the Dead, the spirit of Voiture was discernible, though more extended and more philosophical. His Plurality of Worlds is a work singular in its kind; the design of which was to present that part of philosophy to view in a gay and pleasing dress. In his more advanced years, he published comedies, which, though they shewed the elegance of Fontenelle, were little fitted for the stage; and An Apology for Des Cartes's Vortices. M. de Voltaire, who declares him to have been the most universal genius the age of Louis XIV. produced, says, "We must excuse his comedies, on account of his great age; and his Cartesian opinions, as they were those of his youth, when they were universally received all over Europe."

FONTENOY, a town of Hainault, in the Austrian Netherlands, remarkable for a battle fought between the Allies and the French, in May 1745, in which the latter were victorious. It is four miles S. W. of Tournay. Lat. 50. 32 N. Lon. 3. 26 E.

FONTEVRAULT, a town of France, in the department of Maine and Loire. Here was a famous abbey, founded by Robert d'Arbrissel in 1100. Lat. 47. 9 N. Lon. 0. 0.

FONTI'CUELUS (*fonticulus, i*, m. dim. of *fons*, an issue.) An artificial ulcer formed in any part, and kept discharging by introducing daily a pea, covered with any digestive ointment.

FONTINALIS. Water-moss. In botany, a genus of the class cryptogamia, order musci. Capsule oblong, latent, invested with an imbricate scaly sheath, fringe double; outer of sixteen broadish teeth; inner a conic reticulated membrane. Four species: three of them indigenous to our own country, and found on the brinks of rivulets and the trunks of trees. The most remarkable is f. antipyretica with purple stalks: so called from the difficulty with which it catches fire; or rather from the practice of the Scandinavians of lining the insid of their chimney places with this moss to defend them against taking fire.

FOOD. *s.* (fæðan, Saxon.) 1. Victu ; provision for the mouth (*Shakspeare*). 2. A.y thing that nourishes (*Shakspeare*).

FOOD, the substances eaten by anima.. under the impulse of natural instinct, to sustain the body. Providence has ordained that different beings should be supported by such productions of the earth as are especially adapted to their organization. Various directions upon this subject, as it relates to man, will be found in the article DIET. The kinds of food usually appropriated to the use of different domestic animals are too well known to need a description. Some observations on the different qualities of fodder and grain that are used for horses may be important, and may point out the effects they produce on the body, in consequence of an improper use of them.

Hay is the principal fodder used for horses in Britain. Although there are a great number of herbs and grasses mixed with it, yet they are all included under the general denomination of hay. The common distinction that is made is that of natural or meadow-hay, and the sown or rye-grass hay. The natural hay is generally used in the southern parts of Britain. From the method observed in the making of it, and allowing it to heat to a certain degree in the rick, it acquires an uncommon smell, something like that of malt dried on the kiln. This practice likewise gives it a sweetishness to the taste, and it is then called mow-burnt hay. Horses eat greedily of it; and, as it is of a soft quality, they swallow large mouthfuls without chewing it properly. This, producing thirst, causes them to drink a great deal of water, which considerably increases the bulk of the stomach. In this state, the lungs, the diaphragm, and other viscera surrounding it, are compressed to an uncommon degree: and if the horse is then put to any exercise that requires activity or expedition, he is in danger of becoming broken-winded; for it is always observed, that the latter disease may be traced to some instance of sharp exercise performed when the stomach is full. There is a greater number of broken-winded horses in countries where this kind of hay is used

than in those parts where rye-grass i. the common fodder.

Gibson, however, in his treatise on the food of horses, condemns the use of rye-grass. He says, that " in England, it is seldom given but in the months of August and September, except to horned cattle. Before Michaelmas it is tolerably hard and dry, especially in dry seasons; and many feed their working horses with it, mixed with dry clover: but afterwards it imbibes so much moisture that it becomes unwholesome, and few horses that have been used to good hay will care for it." Here, however, Mr. Clarke differs from Mr. Gibson; for he says, that, where rye-grass mixed with a little clover is much used, it is found to be a clean wholesome fodder for horses; and those that are constantly fed upon it are not so subject to be broken-winded as those that are fed with natural hay that is mow-burnt, whilst, at the same time, they perform the exercises required of them with strength and vigour. Nor does he, in another respect, agree with Gibson, who, in the same page, says, that " soft hay, of all others, imbibes moisture the easiest, and retains the effects of it the longest, which generally turns it rotten and unwholesome, and so affords but a crude faint nourishment; and those horses that are forced to feed upon it, for want of better, are generally weak and faint, and in time grow diseased."

" It is well known," says Mr. Clark, " that natural hay is much softer than rye-grass hay; of course, it is more liable to attract moisture, and to acquire all the bad qualities above mentioned: whereas rye-grass hay, being harder and firmer in its texture, will not so readily become moist; consequently, according to the author's reasoning, the latter should be the wholesomest fodder for horses. Another recommendation in its favour is, that, being harder and firmer than natural hay, it obliges a horse to chew it more completely before he can swallow it. This makes it easier of digestion, less bulky in the stomach, and, of course, not so liable to produce the bad effects which have been mentioned.

" But, whatever be the quality of hay, much depends upon its being well got in; for the best grass that ever was cut for this purpose may be spoiled by wet weather, or by bad management; and, where there is a choice, the best should always be given to horses that are employed in active exercises.

" Clover-hay," says Mr. Clark, " should only be given to cattle and draught-horses, whose labour is slow and equal. It cannot be recommended as a proper fodder for horses that stand much at rest, nor to those who are used in violent exercise of any kind, as they are apt to over-feed upon it.

" Wheat-straw is generally used as litter. It is seldom given as fodder, unless to draught-horses, or when it is chopped or cut small, and mixed with oats, &c. in order to oblige horses to break their food thoroughly before they can swallow it. Yet the highest fed horses, when it is fresh laid before them, are not only fond of picking the unthreshed heads of wheat that remain on the straw, but are likewise fond of the straw itself, by way of a change.

" Barley and oat straw are the common fodder of cattle and farm-horses. They are seldom given to the better kind of horses, unless it be out of economy, or by way of amusing them when they stand idle in the stable, and to prevent them from being restless for want of other food.

" Pease and bean straw are a dangerous fodder to horses that are not brought up or gradually accustomed to it, as it is hard of digestion. It is likewise apt to produce flatulencies, attended with griping pains and obstructions in the bowels. It is commonly given to work-horses and horned cattle.

" New hay of any kind should not be given to horses, more especially to those employed in active exercises, as they feed upon it too greedily, and swallow it without chewing it properly. It overloads the stomach, and, at the same time, produces a crude watery chyle, which disposes the horse to sweat much, which weakens greatly; therefore it should never be given till the superfluous moisture it contains is dried up, which will require some months after it is got in. But to such horses as are employed in very active exercises, it should at least be eight or ten months old.

" Grass is the most natural food for horses; but, whether it proceeds from the coldness of the soil or climate in Britain, it does not produce such rich nourishment as to enable them to perform any active exercises with the same strength and vigour as in warmer climates, without the addition of grain, as oats, &c. When horses are allowed to run abroad, and have a sufficiency of oats, and, at the same time, are provided with proper shades to protect them from the inclemency of the weather, we find, from experience, that they thrive and perform any active labour as well as those horses that are kept in stables on dry food only; together with this advantage, that they are not so subject to diseases, nor to lameness, but what, in the latter case, may proceed from accidents among themselves.

" Grass is not only food, but it is likewise physic to horses—I mean the early or spring grass. When the viscera are sound, it cures most of the diseases they are subject to with more certainty and expedition than can be done by medicine. After a long course of dry feeding and hard labour, it restores the constitution to the highest health and strength. It cleanses the bowels, and carries off those chalky concretions that are apt to be produced in the stomachs of such horses as have been long used to dry hard feeding. It likewise carries off the different species of worms with which they are infested. It renovates, as it were, the whole mass of fluids in the body. It promotes all the secretions, and removes glandular obstructions; and, in many cases, it carries off stiffness in the joints, and other lameness; and, upon the whole, it restores the body to the highest state of perfection of which it is capable."

The author, however, observes, that the usual advantages that arise to horses from their feeding on spring grass are in a great measure lost to them, if they are allowed to continue through the summer, when the grass becomes too rank; for they then grow fat and corpulent, and by no means fit for active exercises of any kind, which cannot be attempted without danger. It is customary, indeed, when horses are too fat, and full of blood, to reduce them by bleeding, purging, &c.; but these, when too frequently repeated, impair their constitutions, and bring on a premature old age.

If, instead of undergoing this kind of medical discipline, those horses that are intended for hunting, &c. were taken up from grass as soon as it begins to shoot, and kept in constant daily exercise, although fed with a very moderate allowance of oats at the time, as the hunting season approaches, both their feeding and exercise may

be gradually increased. They will become, by this management, in a proper condition for the severest exercises, without any purging or othe evacuation. See the article PHYSIC.

Another salutary effect of grass is, that it dissolves the concretions that are apt to grow in the stomach and other viscera of horses. Van Swieten, when treating of chalky matter found in the liver in the human subject, says, that incrustations, like gypsum, or plaster of Paris, were often observed by Glisson in the pori biliarii, and its larger branches, dispersed through the livers of oxen that had been fed in stalls with hay and straw, during the winter season, and without exercise. These concretions, however, were very friable, and would " dissolve again, and pass out of the body, when the cattle came to feed upon the fresh grass of the meadows;" for, in oxen that are slaughtered in spring and summer, these substances are very rarely found.

The experience of Mr. Clark confirms this statement; for, in dissecting horses, he frequently met with chalky concretions in the liver and in the lungs, especially in those animals that had been fed long on dry food. In other instances, he found round or oval balls in the stomach, seeming, for the most part, to be composed of the dust they lick from their own bodies, mixed with the hair. Whether the fresh grass dissolves these, he says, is not so certain; but that it causes these concretions to pass through the intestines, he had a full demonstration in the following instance:

" In May, 1786, a horse that had been long fed on dry food was turned out to grass; in about eight or ten days afterwards, he was seized with violent griping pains, which lasted about twenty-four hours, when he died. As the horse was very fat, the man who had the charge of him wanted to make something of his grease: in searching for it, he observed a large portion of the intestine of a very black colour; and, on feeling it, found something hard and weighty. He immediately cut the intestine open with his knife, and took out a large oval hard ball, which measured four inches in length, and three inches and a half in breadth. That this concretion was originally formed in the stomach there can be no doubt, as they frequently, upon dissection, have been found there; and nothing but its great bulk had hindered it from passing through the intestines."—That these solid accumulations are not by any means unfrequent we have shewn under the article CALCULUS, where a means of preventing this evil is suggested by Dr. Withers of Newbery.

Mr. Clark further observes, with respect to the properties of spring grass, that those horses that cannot be turned out to pasture should have it given them in the house as soon as it can be cut. Indeed he reprobates the too general, and even boasted practice, of feeding horses for years together on hard dry food; to which he ascribes that loathsome disease the farcy, which prevails most in England, where dry food is more persevered in than in Scotland. To the objection that horses kept for active exercises reap no advantage from oats, &c. whilst they are at grass, because the grass tends to carry off the nourishment that should be produced by the former, he answers that, " although the early grass purges a horse gently at first feeding on it, yet this purging does not continue long, neither is it attended with that weakness, faintness, and loss of flesh, which is observed in horses purged by strong medicines, where the evacuation is brought on suddenly, and perhaps to an excess."

" *A change of diet,*" the author observes, " *is not only agreeable, but wholesome for horses, as it contributes to keep them open in the body.* Malt mixed occasionally with their food proves a medicine.

" Wheat, notwithstanding it affords the most nourishment, is seldom given to horses, probably owing to its price being higher than that of other grain. It is apt to purge horses a little on the first using of it; they eat it greedily, and are fond of it: but, as it becomes very slippery from the moisture in the mouth, it is swallowed whole, and passed through the body in that state; but, when it is given bruised, or mixed with chopped straw, the horse is obliged to break it minutely with his teeth before he can swallow it." It then proves very nourishing, and enables him to go through much labour. It likewise makes a horse coat well, and causes his hair to lie smooth and shining."

By lord Kaimes's calculation, the boll of middling wheat weighs fourteen stone, Dutch weight; the husks weigh two stone: for which reason, when wheat is given to horses, a less quantity will be necessary than of oats, the proportion of nourishment being as the weight.

It is well known, that barley purges horses on the first using of it; but, when it is given mixed with cut straw, it proves a wholesome nourishing diet. The Arabian, the Barbary, and other eastern horses, eat it; and these animals undergo great fatigue, and perform journeys with incredible swiftness. In England, however, farmers, grooms, &c. are much prejudiced against feeding their horses with barley, as they allege that it gives them the itch. But Mr. Clark affirms, from his own experience, that it has a very opposite effect; and that, if horses troubled with cutaneous eruptions are fed on barley, either raw or boiled, it will contribute greatly towards their cure. The boll of middling barley weighs eighteen stone, Dutch weight; the husks one stone four pounds. When it is boiled, it proves light, and easy of digestion; for which reason it may be properly given to horses when they are sick, or to prevent costiveness.

" Oats, notwithstanding they are reckoned more heating and binding than any of the former grain, yet they are generally given to horses in Britain. To post and other carriage horses they are frequently given mixed with beans, which obliges them to break both oats and beans minutely before they can be swallowed. The adding of the beans makes this feeding very nourishing. On that account, beans should never be given mixed with oats to those horses that stand much at rest, or have not sufficient exercise. The boll of middling oats weighs fourteen stone, Dutch weight; the husks weigh six stone. Therefore, as oats have more husks than any other grain, a greater quantity is necessary. For this reason, it is probable that the standard measure of oats is larger than that of other grain. The constant feeding with oats, although it is esteemed what is called clean feeding, yet it is apt to make horses too costive, &c.; to prevent which, bran, mashed up with boiling water, is given once a-week, or as circumstances may require.

" Beans are seldom or never given to horses by themselves, unless to labouring horses. When they are boiled, they afford the strongest nourishment of all the other grain. The boll of middling beans weighs fifteen stone eight pounds; the husks weigh eight pounds, which is the smallest proportion of husks in all the grain now mentioned. Of course, they contain more nourishment;

but, as they contain a great proportion of fixed air, when given in a raw state and in too great a quantity, they are found to produce flatulence, gripes, &c."

After having fully described the different kinds of fodder, grain, &c. and their uses in the feeding of horses, Mr. Clark proceeds to consider how these are or ought to be applied to the greatest benefit. He quotes the count de Buffon (vol. iii. page 375), who asserts, " that the Tartar horses will travel two or three days without stopping; receiving, for four or five days on end, only a handful of herbage every eight hours; and, at the same time, kept from drinking for twenty-four hours." In the same volume (page 369), the same writer says, " that the Arabian horses are rather meagre than fat. During the day they are not permitted to eat, but are watered twice or thrice. At sun-set, a bag, containing about half a bushel of barley, is passed over their heads, and fastened to their necks. This bag is not removed till next morning, when the barley is entirely consumed. When the grass is good, they are turned out to pasture: and, during the rest of the year, they are allowed neither grass nor hay, and rarely straw, barley being their only food: and great care is taken to give them only as much as is barely necessary; for too much nourishment makes their legs swell, and soon renders them useless."

In another place, the count tells us, that " the horses which are bred in the Indies are very indifferent. Those used by the great men of the country are brought from Persia and Arabia. They are fed with hay during the day; and, at night, in place of barley and oats, they get pease boiled with sugar and butter. This nourishing diet supports them, and gives them some degree of strength: without it they would soon perish, the climate not being adapted to their constitution."

Mr. Berringer notices that " the Indians feed their horses in the rice-fields; and, when flesh is plenty, they boil the offal to rags, and, mixing it with butter, and some sorts of grain, make balls, which they thrust down the horses' throats. In scarcity of provision, they give them opium, which has the same effects both on horses and men; for it at once damps their appetites and enables them to endure fatigue."

We may here advert to Gibson's objection to the use of greasy or oily substances as food for horses.

Buffon likewise tells us (vol. iii. page 388), that, " in Iceland, where the cold is excessive, and where often no other food can be had than dried fishes, the horses, though small, are extremely vigorous."

" The Arabian horses intended for hunting in Arabia or Barbary seldom eat herbage or grain. Their common food, which consists of dates and camels' milk, is given them every morning and at night. These aliments, instead of fattening them, render them meagre, nervous, and very fleet. They spontaneously suck the she-camels, whom they follow till the time they are ready for mounting, which is not before the age of six or seven years."

Mr. Berringer, in his curious work on horsemanship, says, " Nemesian recommends straw and barley as very nourishing diet; and it certainly conduces very much to keep horses in health, spirits, and wind, and in a state of body fit for any kind of labour, as it supports and strengthens, without rendering the animal heavy and corpulent.

" The Kalmuck horses are so hardy and strong *in their constitution as to be able to run three or four hundred English miles in three days. They* subsist, summer and winter, solely upon grass in the great desarts."

The rules of diet applicable to horses, and the common errors of those concerned in the care of them, are thus judiciously treated of by Mr. Clark.

" As horses are not endowed with reason, but guided entirely by instinct to such aliments as correspond with their constitutions, the appetite for food excites in them a strong desire to gratify this sense. They are therefore apt to indulge in it to excess when it is laid before them, especially grain of any kind, and more so when confined in the stable, where they have no other amusement to divert them from it. For, in the fields, at grass, after they are satisfied with eating, they run about, and play with one another a considerable part of their time, and do not begin to eat till prompted to it by hunger. For this reason, there are few or no instances of horses over-eating themselves when running at grass.

" Young horses, in particular, are most liable to be injured by too much feeding with grain. The blood of young animals is naturally disposed to be hot; high feeding increases this disposition, and renders them more subject to inflammatory diseases. Hence dry feeding with oats, &c. produces a plethoric habit of body, which renders them liable to fevers, swelled legs, and greasy heels, and, upon catching the least cold, to a variety of other disorders.

" Besides the ordinary feeding with oats, &c. at stated times through the day, it is too common to keep the racks at all times filled with hay. Hence many horses, having stuffed themselves, drink a great quantity of water, and, when they come to be exercised, they are hardly able to breathe. Numbers of horses are daily ruined from this practice; yet many people are not aware of its effects.

" There are horses too of delicate stomachs, who loath their food, from its being too constantly before them, and not having sufficient time or exercise to digest what they have eaten; besides, having constantly breathed upon it, they cannot relish it afterwards. It ought, in all cases, to be remembered, that it is not the quantity of food merely which a horse eats that produces the wholesomest nourishment, but it is what he digests well that invigorates and strengthens; for, when the stomach is overloaded with food, the body is dull, heavy, oppressed, sluggish, and stupid, and the digestive faculty is impaired.

" Throwing great quantities of grain before horses at one time is very improper: they, in this case, dip their mouths in it with eagerness, by which means they grasp more than they can break down properly; they devour it greedily, and swallow whole mouthfuls of it almost dry. The natural moisture of the stomach, or water drunk immediately after eating, causes the grain to swell, by which the stomach is greatly distended, and thereby loses its contractile power to act upon the food. By its uncommon pressure upon the intestines, the passage for the food backwards is obstructed. The confined air, arising from the indigested food not having a ready passage backwards, and horses not possessing the power of eructation, or belching, the air, by the heat and confinement, becomes rarefied to a great degree, and the horse is seized with the most acute pains; as they increase, he becomes convulsed, and in many cases the stomach bursts, and death follows of course."

These cases clearly shew how necessary it is not to allow horses to eat too great a quantity of grain at one time, but to give it them in small quantities, and repeat it the more frequently, spreading it carefully in the trough or manger. At the same time, they shew the propriety of mixing chopped straw or hay with the grain, in order to make them chew it thoroughly before they swallow it; a circumstance to which the earl of Pembroke particularly adverts in his excellent treatise upon horses. "Every grain," says he, "goes to nourishment: none is to be found in the dung; and three feeds of it go farther than four, as commonly given, which have not been in the mill. But wheaten straw, and a little hay too sometimes mixed with it, is excellent food. To a quarter of corn put the same quantity of straw. It obliges them to chew their meat, and is in many other ways of use."

The opposite extreme, namely, too small an allowance of food, when horses are worked hard, also disposes them to many diseases. A famished horse becomes weak and spiritless, his body emaciated, his circulation faint and languid. Dropsical swellings appear in different parts of the body, but particularly in the extremities; the blood loses its natural colour and quality, and the animal sinks under a complication of diseases, which are consequent upon an impoverished state of the blood and juices. "Hence, therefore, it will appear," says Mr. Clark, "what care and attention are necessary in the feeding of horses, and how much depends on the conducting it in a proper and regular manner.

"Although it is extremely difficult to lay down any fixed rules for the feeding of horses, yet it may be observed, in general, that all extremes in the feeding of them ought to be avoided. Those that are constantly employed in hard labour, or active exercises, require to be fed with more grain than those that stand much at rest in the stable, or only perform gentle exercises, which occasion no great waste in the constitution. Upon the whole, the feeding of horses ought at all times to be proportioned to their labour, or the exercises they are employed in.

"Post-horses, hunters, and other horses employed in such violent exercises, ought to be fed chiefly with grain during the time of their being so employed. The former frequently eat from four to six or more feeds of oats, mixed with beans, per day, of the oat standard measure, which is the largest measure of all other grain. But this high feeding should not be continued for too great a length of time, without a little relaxation both from severe labour and high feeding. The latter should be changed occasionally to that which is soft and moist, as boiled barley, malt, or a little fresh grass in the season. This should be continued for a short time only, by way of change of diet.

"Wheat and barley should likewise be given to horses frequently, by way of a change of diet; and all grain that is given them, if possible, should be bruised in a mill, or otherwise, for the reasons already mentioned. This would not only be a saving of grain, but attended with considerable advantage in other respects."

Too new grain of any kind should never be given to horses that are employed in active exercises: it produces the same bad effects as new hay, and disposes the horse to sweat much, and frequently occasions a severe looseness. Indeed, if the grain, at the same time, chance to be bad of its kind, the diarrhœa may continue with such severity as to prove fatal; of which we have too many instances.

Costiveness, which is another effect of hard dry food, Mr. Clark says, should be particularly guarded against. This, like most diseases to which horses are liable, is easier prevented than cured, by giving mashes of bran, boiled barley, or malt, once a-week, or oftener, by way of prevention.

FOO'DFUL. *a.* (*food* and *full.*) Fruitful; full of food; plenteous (*Dryden*).

FOO'DY. *a.* (from *food.*) Eatable; fit for food.

FOOL. *s.* (*ffol*, Welsh.) 1. One to whom nature has denied reason; a natural; an ideot (*Pope*). 2. (In Scripture.) A wicked man (*Psalms*). 3. A term of indignity and reproach (*Dryden*). 4. One who counterfeits folly; a buffoon; a jester (*Denham*). 5. *To play the* Fool. To play pranks like a hired jester; to make sport (*Sidney*). 6. *To play the* Fool To act like one void of common understanding (*Shakspeare*). 7. *To make a* Fool *of.* To disappoint; to defeat (*Shakspeare*).

To Fool. *v. n.* (from the noun. To trifle; to toy; to play; to idle; to sport (*Herbert*).

To Fool. *v. a.* 1. To treat with contempt; to disappoint; to frustrate; to defeat (*B. Jonson*). 2. To infatuate; to make foolish (*Calamy*). 3. To cheat; as, to *fool* one of his money.

FOO'LBORN. *a.* (*fool* and *born.*) Foolish from the birth (*Shakspeare*).

FOO'LERY. *s.* (from *fool.*) 1. Habitual folly (*Shakspeare*). 2. An act of folly; trifling practice (*Watts*). 3. Object of folly (*Raleigh*).

FOOLHA'PPY. *a.* (*fool* and *happy.*) Lucky without contrivance or judgment (*Spenser*).

FOOLHA'RDINESS. *s.* (from *foolhardy.*) Mad rashness; courage without sense (*South*).

FOOLHA'RDISE. *s.* (*fool* and *hardiesse*, French.) Foolhardiness: obsolete (*Spenser*).

FOOLHA'RDY. *a.* (*fool* and *hardy.*) Daring without judgment; madly adventurous (*Hooker*).

FOO'LISH. *a.* (from *fool.*) 1. Void of understanding; weak of intellect. 2. Imprudent; indiscreet (*Shakspeare*). 3. Ridiculous; contemptible (*Law*). 4. (In Scripture.) Wicked; sinful.

FOO'LISHLY. *ad.* (from *foolish.*) Weakly; without understanding. In Scripture, wickedly (*Swift*).

FOO'LISHNESS. *s.* (from *foolish.*) 1. Folly; want of understanding. 2. Foolish practice; actual deviation from the right (*Prior*).

FOO'LSTONES. *s.* A plant (*Miller*).

Foolstones, in botany. See Orchis.

FOO'LTRAP. *s.* (*fool* and *trap.*) A snare to catch fools in (*Dryden*).

FOOT. *s.* plural *feet.* (fot, Sax.) 1. The part upon which we stand (*Clarend.*). 2. That by which any thing is supported in the nature of a foot: as, *the* foot *of a table.* 3. The lower part; the base (*Hakewill*). 4. The end; the lower part (*Dryden*). 5. The act of walking

(*Maccabees*). 6. *On* Foot. Walking; without carriage. 7. *On* Foot. In a posture of action (*Shakspeare*). 8. Infantry; footmen in arms (*Clarendon*). 9. State; character; condition (*Addison*). 10. Scheme; plan; settlement (*Swift*). 11. A state of incipient existence (*Tillotson*). 12. A certain number of syllables constituting a distinct part of a verse (*Ascham*). 13. Motion; action (*Grew.*) 14. Step (*L'Estrange*). 15. A measure containing twelve inches.

Foot (Square), is a square, each side of which is 12 inches; its surface, therefore, contains 144 square inches.

Foot (Solid), is a cube whose three dimensions are each 12 inches: its capacity is therefore 1728 cubic inches.

Foot of a horse extends from the fetlock-joint to the outer sole at the bottom of the hoof: it includes the coronary-bone, the nut-bone, the coffin-bone, and the inner sole (or membranous mass), in which it is deposited; as well as the frog and the wall or hoof surrounding and supporting the whole.

To Foot. *v. n.* (from the noun.) 1. To dance; to tread wantonly; to trip (*Dryden*). 2. To walk; not ride (*South*).

To Foot. *v. a.* 1. To spurn; to kick (*Shakspeare*). 2. To settle; to begin to fix (*Shakspeare*). 3. To tread (*Tickel*).

FOOTBALL. *s.* (*foot* and *ball.*) 1. A ball commonly made of a blown bladder, cased with leather, driven by the foot (*Waller*). 2. The sport or practice of kicking the football (*Arbuthnot*).

FOOTBOY. *s.* (*foot* and *boy.*) A low menial; an attendant in livery (*Boyle*).

FOOTBRIDGE. *s.* A bridge on which passengers walk; a narrow bridge (*Sidney*).

FOOTCLOTH. *s.* A sumpter cloth (*Shakspeare*).

FOOT DEROBE, in the manage. A horse's foot has this appellation when it is worn and wasted by going without shoes, so that, for want of hoof, it is a hard matter to shoe him. A horse's foot is said to be worn and wasted, called in French *usé*, when he has but little hoof, and not enough for shoeing.

FOOT-FAT, in the manage. A horse is said to have a fat foot, when the hoof is so thin and weak, that unless the nails be driven very short, he runs the risk of being pricked in shoeing.

FOOT-HALT, the name of a particular disorder incident to sheep. It arises from an insect, which, when it comes to a certain maturity, resembles a worm of two, three, or four inches in length. The first appearance of the malady is, when the sheep give signs of being lame, which increases so far as to prevent his grazing; when, what with want of sufficient food, and pain, the poor animal suffers greatly, and lingers till it dies a natural death, if not properly attended to by extracting the insect; which is very easily done.

As soon as the lameness is perceived, let the foot that is lame be examined between the close of the claws, and it will be found that in the skin where the close separates is a small hole (not natural), through which the insect, when yet small, gets its entrance, and by degrees has worked itself upwards along the leg, between the outward skin and bone, and obtains its largest magnitude. Proportionally it finds its nourishment, and is left undisturbed. This worm must be extracted by moving the claws backward and forward in contrary directions; and it will not be long before the under part of the worm makes its appearance at the above-mentioned small hole; and continuing the same operation of moving the claws, the whole worm will work itself out; which is better than when at its first appearance it is attempted to be drawn out with danger of breaking off, for part of it might remain in the sheep's leg, and by its rotting there be hurtful. This easy and simple operation will be found effectual without any other kind of application whatever, nature herself curing the channel which the worm had made along the leg.

FOOTSTALK, has been put by English writers both for the peduncle and petiole. See Pedunculus and Petiolus.

FOOTE (Samuel), an English dramatic writer and performer, was born at Truro, in Cornwall, in 1722. His father was a justice of the peace for that county, and his mother sister to sir John Dinely Goodere, of Herefordshire, who was murdered by his brother, captain Goodere, at Bristol. Foote was educated at Worcester college, Oxford, from whence he removed to the Temple; but the liveliness of his mind did not suit with the profession of the law; he therefore abandoned it for the stage.

His first performance was in the character of Othello. In 1747 he opened the little theatre in the Haymarket, with a dramatic piece of his own, called, The Diversions of the Morning, which was represented above forty mornings to crowded audiences. The next season he brought forward another exhibition, called, An Auction of Pictures, in which he took off some of the most noted characters of the day. He still continued to play at one or other of the theatres, and frequently brought out new pieces. In 1760 he produced the Minor at his own house in the Haymarket, and from that time it became a summer theatre. In 1766 he had the misfortune to break his leg while on a visit to lord Mexborough's in the country, in consequence of which he was obliged to have it amputated. He now began to acquire a great deal of money, and his genius being very prolific, he every season produced some laughable caricature of persons well known; which filled the theatre, and consequently his pockets. In 1776 he attacked a lady, then the subject of much conversation; but his piece was suppressed; and some charges were brought against him of a very serious nature, no less than of his having been guilty of an unnatural offence. He was honourably acquitted of this accusation; but it had a deep effect upon his mind, and the year fol-

lowing he died at Dover, in his way to France, for the benefit of his health. His remains were brought to town, and interred in Westminster abbey. Foote has been called the English Aristophanes, and no greater proof can be given of his comic powers than in the following anecdote, related by Dr. Johnson: "The first time," says he, "I was in company with Foote, was at Fitzherbert's. Having no good opinion of the fellow, I was resolved not to be pleased; and it is very difficult to please a man against his will. I went on eating my dinner pretty sullenly, affecting not to mind him; but the dog was so very comical, that I was obliged to lay down my knife and fork, throw myself back in my chair, and fairly laugh it out. Sir, he was irresistible." His dramatic works have been published in 4 vols. 8vo.

FOO'TED. *a.* Shaped in the foot (*Grew*).

FOO'TFIGHT. *s.* A fight made on foot, in opposition to that on horseback (*Sidney*).

FOO'THOLD. *s.* Space to hold the foot; space on which one may tread surely (*L'Estrange*).

FOO'TING. *s.* (from *foot.*) 1. Ground for the foot (*Shakspeare*). 2. Support; root (*Dryden*). 3. Foundation; basis (*Locke*). 4 Place; possession (*Dryden*). 5. Tread; walk (*Milton*). 6. Dance (*Shaks.*). 7. Steps; road; track (*Bacon*). 8. Entrance; beginning; establishment (*Dryden*). 9. State; condition; settlement (*Arbuthnot*).

FOO'TLICKER. *s.* (*foot* and *lick.*) A slave; an humble fawner (*Shakspeare*).

FOO'TMAN. *s.* (*foot* and *man.*) 1. A soldier that marches and fights on foot (*Raleigh*). 2. A low menial servant in livery (*Bacon*). 3. One who practises walking or running.

FOO'TMANSHIP. *s.* (from *footman.*) The art or faculty of a runner (*Hayward*).

FOO'TPACE. *s.* (*foot* and *pace.*) 1. Part of a pair of stairs, whereon, after four or five steps, you arrive to a broad place (*Moxon*). 2. A pace no faster than a slow walk.

FOO'TPAD. *s.* (*foot* and *pad.*) A highwayman that robs on foot.

FOO'TPATH. *s.* (*foot* and *path.*) A narrow way which will not admit horses (*Shakspeare*).

FOO'TPOST. *s.* (*foot* and *post.*) A post or messenger that travels on foot (*Carew*).

FOO'TSTALL. *s.* (*foot* and *stall.*) A woman's stirrup.

FOO'TSTEP. *s.* (*foot* and *step.*) 1. Trace; track; impression left by the foot (*Denham*). 2. Token; mark; notice given (*Bentley*). 3. Example.

FOO'TSTOOL. *s.* (*foot* and *stool.*) Stool on which he that sits places his feet.

FOP. *s.* (probably derived from the *vappa* of Horace, applied in the first satire of the first book to the wild and extravagant Nævius). A simpleton; a coxcomb; a man of small understanding and much ostentation; a pretender (*Roscommon*).

FO'PDOODLE. *s.* (*fop* and *doodle.*) A fool; an insignificant wretch (*Hudibras*).

FO'PPERY. *s.* (from *fop.*) 1. Folly; impertinence (*Shakspeare*). 2. Affectation of show, or importance; showy folly. 3. Foolery; vain or idle practice (*Stillingfleet*).

FO'PPISH. *a.* (from *fop.*) 1. Foolish; idle; vain (*Shakspeare*). 2. Vain in show; foolishly ostentatious (*Garth*).

FO'PPISHLY. *ad.* Vainly; ostentatiously.

FO'PPISHNESS. *s.* Vanity; showy or ostentatious vanity.

FO'PPLING. *s.* (from *fop.*) A petty fop; an underrate coxcomb (*Tickel*).

FOR. *prep.* (ꝼoꞃ, Saxon.) 1. Because of: *he died* for *love* (*Hooker*). 2. With respect to; with regard to: *the troops* for *discipline were good* (*Stillingfleet*). 3. In the character of: *he stood candidate* for *his friend* (*Locke*). 4. With resemblance of: *he lay* for *dead* (*Dryden*). 5. Considered as; in the place of: *rashness stands* for *valour* (*Clarendon*). 6. In advantage of; for the sake of: *he fights* for *fame* (*Cowley*). 7. Conducive to: *this sickness is* for *good* (*Tillotson*). 8. With intention of going to a certain place: *he is gone* for *Oxford* (*Hayward*). 9. In comparative respect: for *height this boy is a man* (*Dryden*). 10. With appropriation to: *frieze is* for *old men* (*Shakspeare*). 11. After O an expression of desire: *O* for *better times* (*Shakspeare*). 12. In account of; in solution of: *I speak enough* for *that question* (*Burnet*) 13. Inducing to as a motive: *he had reason* for *his conduct* (*Tillotson*). 14. In expectation of: *he stood still* for *his follower* (*Locke*). 15. Noting power of possibility: *it is hard* for *me to learn* (*Taylor*). 16. Noting dependence: for *a good harvest there must be fine weather* (*Boyle*). 17. In prevention of; for fear of: *he wrapped up* for *cold* (*Bacon*). 18. In remedy of: *a medicine* for *the gout* (*Garretson*). 19. In exchange of: *money* for *goods* (*Dryden*). 20. In the place of; instead of. *a club* for *a weapon* (*Cowley*). 21. In supply of; to serve in the place of (*Dryden*). 22. Through a certain duration: *it lasted* for *a year* (*Roscommon*). 23. In search of; in quest of: *he went* for *the golden fleece* (*Tillotson*). 24. According to: for *aught I know, it was otherwise* (*Boyle*). 25. Noting a state of fitness or readiness (*Dryden*). 26. In hope of: *he wrote* for *money* (*Shakspeare*). 27. Of tendency to; toward: *his wish was* for *peace* (*Knolles*). 28. In favour of; on the part of: *being honest he fought* for *the king* (*Cowley*). 29. Noting accommodation or adaptation: *the tool is too brittle* for *the wood* (*Felton*). 30. With intention of: *the book was contrived* for *young students* (*Tillotson*). 31. Becoming; belonging to: *must is* for *a king* (*Cowley*). 32. Notwithstanding: *he might have entered* for *the keeper* (*Bentley*). 33. To the use of; to be used in (*Spenser*). 34. In consequence of: *he did it* for *anger* (*Dryden*). 35. In recompense of; in return of: *he worked* for *money formerly paid* (*Dryden*). 36. In proportion to: *he was tall* for *his age* (*Shakspeare*). 37. By means of; by interposition of: *but* for *me you had failed* (*Hale*). 38. In regard of; in

preservation of: *he cannot* for *his life do it* (*Addison*). 39. For *all*. Notwithstanding (*South*).

For. *conj*. 1. The word by which the reason is given of something advanced before (*Cowley*). 2. Because; on this account that (*Spenser*). 3. For *as much*. In regard to that; in consideration of (*Hooker*). 4. For *why*. Because; for this reason that (*Knoll*.).

To FO'RAGE. *v. a.* (from *foris*, abroad, Lat.) 1. To wander far; to rove at a distance: not in use (*Shakspeare*). 2. To wander in search of provisions (*Denham*). 3. To ravage; to feed on spoil (*Shakspeare*).

To Fo'rage. *v. a.* To plunder; to strip; to spoil (*South*).

Fo'rage. *s.* (*fourage*, Germ. and French, from *foris*, Latin.) 1. Search of provisions; the act of feeding abroad (*Milton*). 2. Provisions sought abroad (*Dryden*). 3. Provisions in general (*Dryden*).

FORA'MEN. (*foramen*, from *foro*, to pierce.) A little opening.

Fora'men cæcum. A single opening in the basis of the cranium between the ethmoid and the frontal bone, that gives exit to a small vein.

Fora'men ovale. The opening between the two auricles of the heart of the fœtus. See also Innominatum os.

Foramina lacera in basi cranii. A pair of foramina in the basis of the cranium, through which the internal jugular veins and the eighth pair of accessory nerves pass.

FORA'MINOUS. *a.* (from *foramen*, Lat.) Full of holes; porous (*Bacon*).

To FORBE'AR. *v. n.* pret. *I forbore*, anciently *forbare*; part. *forborn*. (ꝼoꞃbæꞃan, Saxon.) 1. To cease from any thing; to intermit. 2. To pause; to delay (*Shakspeare*). 3. To omit voluntarily; to abstain (*Denham*). 4. To restrain any violence of temper; to be patient (*Proverbs*).

To Forbe'ar. *v. a.* 1. To decline; to avoid voluntarily (*Waller*). 2. To abstain from; to omit (*Clarendon*). 3. To spare; to treat with clemency (*Ephesians*). 4. To withhold (*Chronicles*).

FORBE'ARANCE. *s.* (from *forbear*.) 1. The care of avoiding or shunning any thing; negation of practice (*South*). 2. Intermission of something. 3. Command of temper (*Shakspeare*). 4. Lenity; delay of punishment; mildness (*Rogers*).

FORBE'ARER. *s.* (from *forbear*.) An intermitter; interceptor of any thing (*Tusser*).

To FORBI'D. *v. a.* pret. *I forbade*; part. *forbidden* or *forbid* (ꝼoꞃbeoꝺan, Sax.) 1. To prohibit; to interdict any thing (*Shaksp*.). 2. To command to forbear any thing (*Sidney*). 3. To oppose; to hinder (*Dryden*). 4. To accurse; to blast: obsolete (*Shakspeare*).

To Forbi'd. *v. n.* To utter a prohibition (*Shakspeare*).

FORBI'DDANCE. *s.* (from *forbid*.) Prohibition; edict against any thing (*Milton*).

FORBI'DDENLY. *ad.* (from *forbid*.) In an unlawful manner (*Shakspeare*).

FORBI'DDER. *s.* (from *forbid*.) One that prohibits (*Brown*).

FORBI'DDING. *particip. a.* (from *forbid*.) Raising abhorrence (*Aaron Hill*).

FORCE. *s.* (*force*, French.) 1. Strength; vigour; might (*Donne*). 2. Violence (*Dryden*). 3. Virtue; efficacy (*Locke*). 4. Validness; power of law (*Denham*). 5. Armament; warlike preparation (*Waller*). 6. Destiny; necessity; fatal compulsion.

To Force. *v. a.* (from the noun.) 1. To compel; to constrain (*Swift*). 2. To overpower by strength (*Milton*). 3. To impel; to press; to draw or push by main strength (*Dryden*). 4. To enforce; to urge (*Milton*). 5. To drive by violence or power (*Decay of Piety*). 6. To gain by violence or power (*Dryden*). 7. To storm; to enter by violence (*Waller*). 8. To ravish; to violate by force (*Dryden*). 9. To constrain; to distort (*Addison*). 10. To man; to strengthen by soldiers (*Raleigh*). 11. *To* Force *out*. To extort (*Atterbury*).

To Force. *v. n.* To lay stress upon (*Camden*).

Force, or Power, in physics, is that which causes a change in the state of a body, whether that state be rest or motion.

We speak here of proximate causes, for it is not the business of mechanics to search into the essential and hidden causes of motion. The enquiry whether they are material or spiritual may exercise the talents of ingenious speculatists, and may, perhaps, be of some importance in a moral point of view; but certainly forms no part of the principles of mechanical science. The muscular power of animals, as likewise pressure, impact, gravity, electricity, &c. are by us looked upon as forces, or sources of motion; for it is an incontrovertible fact that bodies exposed to the free action of either of these are put into motion, or have the state of their motion changed. All forces, however various, are measured by the effects they produce in like circumstances; whether the effects be creating, accelerating, retarding, or deflecting motions: the effect of some general and commonly observed force is taken for unity; and with this any others may be compared, and their proportions represented by numbers or by lines: in this point of view they are considered by the mathematician; all else falls within the province of the universal philosopher or the metaphysician. When we say that a force is represented by a right line AB it is to be understood that it would cause a material point situated at rest in A, to run over the line AB (which we name the direction of the power) so as to arrive at B, at the end of a given time; while another power should cause the same point to have moved a greater or less distance from A in the same time.

Mechanical forces may be reduced to two sorts; one of a body at rest, the other of a body in motion.

The force of a body at rest, is that which we conceive to be in a body lying still on a table, or hanging by a rope, or supported by a spring, &c.; and this is called by the names of pressure, tension, force, or *vis mortua, solicitatio, conatus movendi, conamen*, &c.; which kind of force may be always measured by a weight, viz. the weight that sustains it. To this class of forces may also be referred

centripetal and centrifugal forces, though they reside in a body in motion; because these forces are homogeneous to weights, pressures, or tensions of any kind. The pressure, or force of gravity in any body, is proportional to the quantity of matter in it.

The force of a body in motion, is a power residing in that body, so long as it continues its motion; by means of which, it is able to remove obstacles lying in its way; to lessen, destroy, or overcome the force of any other moving body, which meets it in an opposite direction; or to surmount any the largest dead pressure or resistance, as tension, gravity, friction, &c. for some time; but which will be lessened or destroyed by such resistance as lessens or destroys the motion of the body. This is called *vis motrix*, moving force, or motive force, and by some late writers *vis viva*, to distinguish it from the *vis mortua*, spoken of before.

Concerning the measure of moving force mathematicians have been divided into two parties. It is allowed on both hands, that the measure of this force depends partly upon the mass of matter in the body, and partly upon the velocity with which it moves: the point in dispute is, whether the force varies as the velocity, or as the square of the velocity.

Descartes, and all the writers of his time, assumed the velocity produced in a body as the measure of the force which produces it; and observing that a body, in consequence of its being in motion, produces changes in the state or motion of other bodies, and that these changes are in the proportion of the velocity of the changing body, they asserted that there is in a moving body a *vis insita*, an inherent force, and that this is proportional to its velocity; saying that its force is twice or thrice as great, when it moves twice or thrice as fast at one time as at another. But Leibnitz observed, that a body which moves twice as fast, rises four times as high, against the uniform action of gravity; that it penetrates four times as deep into a piece of uniform clay; that it bends four times as many springs, or a spring four times as strong to the same degree; and produces a great many effects which are four times greater than those produced by a body which has half the the initial velocity. If the velocity be triple, quadruple, &c. the effects are nine times, 16 times, &c. greater; and, in short, are proportional, not to the velocity, but to its square. This observation had been made before by Dr. Hooke, who has enumerated a prodigious variety of important cases in which this proportion of effect is observed. Leibnitz, therefore, affirmed that the force inherent in a moving body is proportional to the square of the velocity.

It is evident that a body, moving with the same velocity, has the same inherent force, whether this be employed to move another body, to bend springs, to rise in opposition to gravity, or to penetrate a mass of soft matter. Therefore these measures, which are so widely different, while each is agreeable to a numerous class of facts, are not measures of this something inherent in the moving body which we call its force, but are the measures of its exertions when modified according to the circumstances of the case; or, to speak still more cautiously and securely, they are the measures of certain classes of phenomena consequent on the action of a moving body. It is in vain, therefore, to attempt to support either of them by demonstration. The measure itself is nothing but a definition. The Cartesian calls that *a double force which produces a double velocity in the body on which it acts*. The Leibnitzian calls that *a quadruple force which makes a quadruple penetration*. The reasonings of both in the demonstration of a proposition in dynamics may be the same, as also the result, though expressed in different numbers.

But the two measures are far from being equally proper; for the Leibnitzian measure obliges us to do continual violence to the common use of words. When two bodies moving in opposite directions meet, strike each other, and stop, all men will say that their forces are equal, because they have the best test of equality which we can devise. Or when two bodies in motion strike the parts of a machine, such as the opposite arms of a lever, and are thus brought completely to rest, we and all men will pronounce their mutual energies by the intervention of the machine to be equal. Now, in all these cases, it is well known that a perfect equality is found in the products of the quantities of matter and velocity. Thus a ball of two pounds, moving with the velocity of four feet in a second, will stop a ball of eight pounds moving with the velocity of one foot per second. But the followers of Leibnitz say, that the force of the first ball is four times that of the second.

All parties are agreed in calling gravity an uniform or invariable accelerating force; and the definition which they give of such a force is, that it always produces the same acceleration, that is, equal accelerations in equal times, and therefore produces augmentations of velocity proportionable to the times in which they are produced. The only effect ascribed to this force, and consequently the only thing which indicates, characterises, and measures it, is the augmentation of velocity. What is this velocity, considered not merely as a mathematical term, but as a phenomenon, as an event, a production by the operation of a natural cause? It cannot be conceived any other way than as a determination to move on for ever at a certain rate, if nothing shall change it. We cannot conceive this very clearly. We feel ourselves forced to animate, as it were, the body, and give it not only a will and intention to move in this manner, but a real exertion of some faculty in consequence of this determination of mind. We are conscious of such a train of operations in ourselves; and the last step of this train is the exertion or energy of some natural faculty, which we, in the utmost propriety of language, call force. By such analogical conception we suppose a something, an energy inherent in the moving body; and its only office is the production and continuation of this motion, as in our own case. Scientific curiosity was among our latest wants, and language was formed long before its appearance: as we formed analogical conceptions, we contented ourselves with the words already familiar to us, and to this something we gave the name Force, which expressed that energy in ourselves which bears some resemblance (in office at least) to the determination of a body to move on at a certain rate. This sort of allegory pervades the whole of our conceptions of natural operations, and we can hardly think or speak of any operation without a language, which supposes the animation of matter. And, in the present case, there are so many points of resemblance between the effects of our exertions and the operations of nature, that the language is most expressive, and has the strongest appearance of propriety. By exerting our force, we not only move and keep in motion, but we move other

bodies. Just so a ball not only moves, but puts other bodies in motion, or penetrates them, &c.—This is the origin of that conception which so forcibly obtrudes itself into our thoughts, that there is inherent in a moving body a force by which it produces changes in other bodies. No such thing appears in the same body if it be not in motion. We therefore conclude, that it is the production of the moving force, whatever that has been. If so, it must be conceived as proportional to its producing cause. Now this force, thus produced or exerted in the moving body, is only another way of conceiving that determination which we call velocity, when it is conceived as a natural event. We can form no other notion of it. The *vis insita*, the determination to move at a certain rate, and the velocity, are one and the same thing, considered in different relations.

Therefore the *vis insita corpori moventi*, the determination to move at a certain rate, and the velocity, should have one and the same measure, or any one of them may be taken for the measure of the other. The velocity being an object of perception, is therefore a proper measure of the inherent force; and the propriety is more evident by the perfect agreement of this use of the words with common language. For we conceive and express the action of gravity as uniform, when we think and say that its effects are proportional to the times of its action. Now all agree, that the velocity produced by gravity is proportional to the time of its action. And thus the measure of force, in reference to its producing cause, perfectly agrees with its measure, independent of this consideration.

But this agreement is totally lost in the Leibnitzian doctrine; for the body which has fallen four times as far, and has sustained the action of gravity twice as long, is said to have *four* times the force.

The quaintness and continual paradox of expression which this measure of inherent force leads us into, would have quickly exploded it, had it not been that its chief abettors were leagued in a keen and acrimonious warfare with the British mathematicians who supported the claim of Sir Isaac Newton to the invention of fluxions. They rejoiced to find in the elegant writings of Huyghens a physical principle of great extent, such as this is, which could be set in comparison with some of the wonderful discoveries in Newton's Principia. The fact, that in the mutual actions of bodies on each other, the products of the masses and the squares of the velocities remain always the same (which they call the *conservatio virium vivarum*), is of almost universal extent; and the knowledge of it enabled them to give ready and elegant solutions of the most abstruse and intricate problems, by which they acquired a great and deserved celebrity. Dr. Robert Hooke, whose observation hardly any thing escaped, was the first (long before Huyghens) who remarked that in all the cases of the gradual production and extinction of motion, the sensible phenomenon is proportional to the square of the produced or extinguished velocity.

John Bernoulli brought all these facts together, and systematized them according to the principle advanced by Huyghens in his treatise on the centre of oscillation. He, and Daniel Bernoulli, gave most beautiful specimens of the prodigious use of this principle, for the solution of difficult physical problems, in their dissertations on the motion and impulse of fluids, and on the communication of motion. It was, however, very early objected to them (we think by Marquis Poleni), that in the collision of bodies, perfectly hard, there was no such *conservatio virium vivarum*; and that, in this case, the forces must be acknowledged to be proportional to the velocities. The objections were unanswerable. But John Bernoulli evaded their force, by affirming, that there were and could be no bodies perfectly hard. This was the origin of another celebrated doctrine, on which Leibnitz greatly plumed himself, the Law of Continuity, viz. that nothing is observed to change abruptly, or *per saltum*. But no one will pretend to say that a perfectly hard body is an inconceivable thing; on the contrary, all will allow, that softness and compressibility are adjunct ideas, and not in the least necessary to the conception of a particle of matter; nay, totally incompatible with our notion of an ultimate atom.

Sir Isaac Newton never could be provoked to engage in this dispute. He always considered it as a wilful abuse of words, and unworthy of his attention. He guarded against all possibility of cavil, by giving the most precise and perspicuous definitions of those measures of forces, and all other quantities which he had occasion to consider, and by carefully adhering to them. And in one proposition of about 20 lines, viz. the 39th of the 1st book of the Principia, he explained every phenomenon adduced in support of the Leibnitzian doctrine, shewing them to be immediate consequences of the action of a force measured by the velocity which it produces or extinguishes. There it appears that the heights to which bodies will rise in opposition to the uniform action of gravity are as the squares of the initial velocities: so are the depths to which they will penetrate uniformly resisting matter: so is the number of equal springs which they will bend to the same degree, &c. We have had occasion to mention this proposition as the most extensively useful of all Newton's discoveries. It is this which gives the immediate application of mechanical principles to the explanation of natural phenomena. It is incessantly employed in every problem by the very persons who hold by the other measures of forces, although such conduct is virtually giving up that measure. They all adopt, in every investigation, the two theorems $f\dot{t}=\dot{v}$, and $f\dot{s}=v\dot{v}$; both of which suppose an accelerating force f proportional to the velocity v which it produces by its uniform action during the time t, and the theorem $\int f\dot{s}=v^2$ is the 39th 1. Princip. and is the *conservatio virium vivarum*.

Let a certain force Q, such, for instance, as would propel a body B with a velocity U, be capable, by its instantaneous action, of raising a mass M, whose weight is W to a certain height H; and let g denote the force of gravity, while $\dot{t}$ is an evanescent element of time. Then, that which has been employed to raise W, to the height H, will be equivalent to WH, this being the effect produced. But H, being a space run over, may be expressed by the product of a velocity V and a time T; and, on the other hand, we have $W=gM=\frac{g\dot{t}M}{\dot{t}}$, where $g\dot{t}$ is manifestly the velocity V′, which would be generated by gravity in the element of time $\dot{t}$. Consequently $WH=\frac{V'M}{\dot{t}}\times VT=VV'M\frac{T}{\dot{t}}=u^2 M\frac{T}{\dot{t}}$, u being the mean propor-

tional between the velocities V and V′: and since T and t are homogeneous quantities, we shall have $WH \propto Mu^2$, the original force being thus resolved into the product of a mass by the square of a velocity, conformably to the notion attached by most foreigners to the term *vis viva*. This force is, notwithstanding, measured by the product BU above: so that the warm discussions on the measure of the force of moving bodies, is reduced to a dispute about words.

Mr. Robins, in his remarks on J. Bernoulli's treatise, intitled, Discours sur les Loix de la Communication du Mouvement, informs us, that Leibnitz adopted this opinion through mistake; for though he maintained that the quantity of force is always the same in the universe, he endeavours to expose the error of Des Cartes, who also asserted, that the quantity of motion is always the same; and in his discourse on this subject in the Acta Eruditorum for 1686, he says that it is agreed on by the Cartesians, and all other philosophers and mathematicians, that there is the same force requisite to raise a body of 1 pound to the height of 4 yards, as to raise a body of 4 pounds to the height of 1 yard; but being shewn how much he was mistaking in taking that for the common opinion, which would, if allowed, prove the force of the body to be as the square of the velocity it moved with, he afterwards, rather than own himself capable of such a mistake, endeavoured to defend it as true; since he found it was the necessary consequence of what he had once asserted; and maintained, that the force of a body in motion was proportional to the height from which it must fall, to acquire that velocity; and the heights being as the squares of the velocities, the forces would be as the masses multiplied by them; whereas, when a body descends by its gravity, or is projected perpendicularly upwards, its motion may be considered as the sum of the uniform and continual impulses of the power of gravity, during its falling in the former case, and till they extinguish it in the latter. Thus when a body is projected upwards with a double velocity, these uniform impulses must be continued for a double time, in order to destroy the motion of the body; and hence it follows, that the body, by setting out with a double velocity, and ascending for a double time, must arise to a quadruple height, before its motion is exhausted. But this proves, that a body with a double velocity moves with a double force, since it is produced or destroyed by the same uniform power continued for a double time, and not with a quadruple force, though it rises to a quadruple height; so that the error of Leibnitz consisted in his not considering the time, since the velocities alone are not the causes of the spaces described, but the times and the velocities together; yet this is the fallacious argument on which he first built his new doctrine; and those which have been since much insisted on, and derived from the indentings or hollows produced in soft bodies by others falling into them, are much of the same kind. Robins's Tracts, vol. 2. p. 178. See also farther on this subject Dr. Reid's valuable disquisition on Quantity, in vol. 45, of the Philosophical Transactions, or New Abridgment, vol. 9, p. 562.

A second observation which has been made by some eminent writers, is, that the effect of a shock of two or more bodies is not produced in an instant, but requires a certain interval of time. If this be so, the heterogeneity between the *vis viva* and *mortua*, or living and dead force, will vanish; *since a pressure may always be assigned, which in the same time*, however little, shall produce the same effect. If then the *vis viva* be homogeneous to the *vis mortua*, and having a perfect measure and knowledge of the latter, we need require no other measure of the former than that which is derived from the *vis mortua* equivalent to it.

Now that the change in the state of two bodies, by their shock, does not happen in an instant, appears evidently from the experiments made on soft bodies: in these, percussion forms a small cavity, visible after the shock, if the bodies have no elasticity. Such a cavity cannot certainly be made in an instant. And if the shock of soft bodies require a determinate time, we must certainly say as much of the hardest, though this time may be so small as to be beyond all our ideas. Neither can an instantaneous shock agree with that constant law of nature, by virtue of which nothing is performed *per saltum*. But it is needless to insist farther upon this, since the duration of any shock may be determined from the most certain principles.

There can be no shock or collision of bodies, without their making mutual impressions on each other: these impressions will be greater or less, according as the bodies are more or less soft, other circumstances being the same. In bodies, called hard, the impressions are small; but a perfect hardness, which admits of no impression, seems inconsistent with the laws of nature; so that while the collision lasts, the action of bodies is the result of their mutually pressing each other. This pressure changes their state; and the forces exerted in percussion are really pressures, and truly *vires mortuæ*, if we will use this expression, which is no longer proper, since the pretended infinite difference between the *vires vivæ* and *mortuæ* ceases.

The force of percussion, resulting from the pressures that bodies exert on each other, while the collision lasts, may be perfectly known, if these pressures be determined for every instant of the shock. The mutual action of the bodies begins the first moment of their contact; and is then least; after which this action increases, and becomes greatest when the reciprocal impressions are strongest. If the bodies have no elasticity, and the impressions they have received remain, the forces will then cease. But if the bodies be elastic, and the parts compressed restore themselves to their former state, then will the bodies continue to press each other till they separate. To comprehend, therefore, perfectly, the force of percussion, it is requisite first to define the time the shock lasts, and then to assign the pressure corresponding to each instant of this time; and as the effect of pressures in changing the state of any body may be known, we may thence come at the true cause of the change of motion arising from collision. The force of percussion, therefore, is no more than the operation of a variable pressure during a given time; and, to measure this force, we must have regard to the time, and to the variations according to which the pressure increases and decreases.

Mr. Euler has given some calculations relative to these particulars; and he illustrates their tendency by this instance: suppose that the hardness of the two bodies, A and B, is equal; and such, that being pressed together with the force of 100lb. the impression made on each is of the depth of $\frac{1}{100}$th part of a foot. Suppose also that B is fixed, and that A strikes it with the velocity of 100 feet

in a second; according to Mr. Euler, the greatest force of compression will be equivalent to 400lb. and this force will produce, in each of these bodies, an impression equal to $\frac{1}{15}$ of a foot; and the duration of the collision, that is, till the bodies arrive at their greatest compression, will be about $\frac{1}{500}$ of a second. Mr. Euler, in his calculations, supposes the hardness of a body to be proportional to the force or pressure requisite to make a given impression on it; so that the force by which a given impression is made on a body, is in a compound ratio of the hardness of the body and of the quantity of the impression. But he observes, that regard must be had to the magnitude of the bodies, as the same impression cannot be made on the least bodies as on the greatest, from the defect of space through which their component particles must be driven: he considers, therefore, only the least impressions, and supposes the bodies of such magnitudes, that with respect to them, the impressions may be looked upon as nothing. What he supposes concerning the hardness of bodies, neither implies elasticity nor the want of it, as elasticity only produces a restitution of figure and impression when the pressing force ceases; but this restitution need not be here considered. It is also supposed, that the bodies which strike each other have plain and equal bases, by which they touch each other in the collision; so that the impression hereby made, diminishes the length of each body. It is farther to be observed, that in Mr. Euler's calculations, bodies are supposed so constituted, that they may not only receive impressions from the forces pressing them, but that a greater force is requisite to make a greater impression. This excludes all bodies, fluid or solid, in which the same force may penetrate farther and farther, provided it have time, without ever being in equilibrio with the resistance: thus a body may continually penetrate farther into soft wax, although the force impelling it be not increased: in these, and the like cases, nothing is required but to surmount the first obstacles; which being once done, and the connection of parts broken, the penetrating body always advances, meeting with the same obstacles as before, and destroying them by an equal force. But Mr. Euler only considers the first obstacles which exist before any separation of parts, and which are doubtless such, that a greater impression requires a greater force. Indeed, this chiefly takes place in elastic bodies; but it seems likewise to obtain in all bodies, when the impressions made on them are small, and the contexture of their parts is not altered.

These things being premised, let the mass or weight of the body A be expressed in general by A, and let its velocity before the shock be that which it might acquire by falling from the height a. Farther, let the hardness of A be expressed by M, and that of B by N, and let the area of the base, on which the impression is made, be cc; then will the greatest compression be made with the force $\sqrt{\frac{MNcc}{M+N} \times Aa}$. Therefore if the hardness of the two bodies, and the plane of their contact during the whole time of their collision be the same, this force will be as $\sqrt{Aa}$, that is, as the square root of the *vis viva* of the striking body A. And as $\sqrt{a}$ is proportional to the velocity of the body A, the force of percussion will be in a compound ratio of the velocity, and of the subduplicate ratio of the mass of the body striking; so that in this case, neither the Leibnitzian nor the Cartesian propositions take place. But this force of percussion depends chiefly on the hardness of the bodies; the greater this is, the greater will the force of percussion be. If M = N, this force will be as $\sqrt{Mcc \times Aa}$, that is, in a compound subduplicate ratio of the *vis viva* of the striking body, of the hardness, and of the plane of contact. But if M, the hardness of one of the bodies, be infinite, the force of percussion will be as $\sqrt{Ncc \times Aa}$; at the same time, if M = N, this force will be as $\sqrt{\frac{1}{2}Ncc \times Aa}$. Therefore, all other things being equal, the force of percussion, if the striking body be infinitely hard, will be to the force of percussion when both the bodies are equally hard, as $\sqrt{2}$ to 1.

Mr. Euler farther deduces from his calculation, that the impression received by the bodies A and B will be as follows; viz. as $\sqrt{\frac{N \times Aa}{\overline{M+N} \times Mcc}}$ and $\sqrt{\frac{M \times Aa}{\overline{M+N} \times Ncc}}$ respectively. If, therefore, the hardness of A, that is M, be infinite, it will suffer no impression; whereas, that on B will extend to the depth of $\sqrt{\frac{Aa}{Ncc}}$. But if the hardness of the two bodies be the same, or M = N, they will each receive equal impressions of the depth $\sqrt{\frac{Aa}{2Ncc}}$. So that the impression received by the body B, in this case, will be to the impression it receives in the former, as 1 to $\sqrt{2}$.

Mr. Euler has likewise considered and computed the case where the striking body has its anterior surface convex, with which it strikes an immoveable body, whose surface is plain. He has also examined the case, when both bodies are supposed immoveable; and from his formulæ he deduces the known laws of the collision of elastic and non-elastic bodies. He has also determined the greatest pressures the bodies receive in these cases; and likewise the impressions made on them. In particular he shews, that the impressions received by the body struck, or B, if moveable, is to the impression received by the same body when immoveable, as $\sqrt{B}$ to $\sqrt{A+B}$.

There are several curious as well as useful observations in Desaguliers's Experimental Philosophy, concerning the comparative forces of men and horses, and the best way of applying them. A horse draws with the greatest advantage when the line of direction is level with his breast; in such a situation, he is able to draw 200lb. for eight hours a day, walking about $2\frac{1}{2}$ miles an hour. But if the same horse be made to draw 240lb. he can work only six hours a day, and cannot go quite so fast. On a carriage, indeed, where friction alone is to be overcome, a middling horse will draw 1000lb. But the best way to try the force of a horse, is to make him draw up out of a well, over a single pulley or roller; and in that case, an ordinary horse will draw about 200lb. as before observed.

It is found, that five men are of equal force with 1 horse, and can, with equal ease, push round the horizontal beam of a mill, in a walk 40 feet wide; whereas, three men will do it in a walk only 19 feet wide.

The worst way of applying the force of a horse

is, to make him carry or draw up hill: for if the hill be steep, three men will do more than a horse, each man climbing up faster with a burden of 100lb. weight, than a horse that is loaded with 300lb.: a difference which is owing to the position of the parts of the human body being better adapted to climb, than those of a horse.

On the other hand, the best way of applying the force of a horse, is the horizontal direction, in which a man can exert the least force: thus, a man that weighs 140lb. when drawing a boat along by means of a rope coming over his shoulders, cannot draw above 27lb., or exert above $\frac{1}{7}$th part of the force of a horse employed to the same purpose; so that, in this way, the force of a horse is equal to that of seven men.

The best and most effectual posture in a man, is that of rowing; when he not only acts with more muscles at once, for overcoming the resistance, than in any other position, but also as he pulls backwards, the weight of his body assists by way of lever. See Desaguliers's Exp. Philos. v. 1. p. 241, where several other observations are made relative to force acquired by certain positions of the body; from which, that author accounts for most feats of strength and activity. See also a Memoir on this subject by M. De la Hire, in the Mem. Roy. Acad. 1729; or in Desaguliers's Exp. &c. p. 267, &c. who has published a translation of part of it with remarks.

Force is distinguished into motive and accelerative or retardive.

Motive force, otherwise called *momentum*, or force of percussion, is the absolute force of a body in motion, &c.; and is expressed by the product of the weight or mass of matter in the body multiplied by the velocity with which it moves. But,

Accelerative force, or retardive force, is that which respects the velocity of the motion only, accelerating or retarding it; and it is denoted by the quotient of the motive force, divided by the mass or weight of the body. So,

if m denote the motive force,
and b the body, or its weight,
and f the accelerating or retarding force,

then is f as $\frac{m}{b}$.

In centripetal forces, the absolute quantity is defined from the magnitude, or at least from the strength and efficacy of the central body. The accelerating is that force as perpetually decreasing in the increase of the distance, *et contra*. The moving force is the weight itself, which arises from the body or mass drawn into the accelerating force. From whence, the absolute force being given, the moving force in a given body will be as the accelerating; and, the accelerating being given, it will be as the body. These three forces, therefore, are referred to three things, to bodies, to the places of bodies, and to the centre of force. The motive force respects the body, and the endeavour and propension thereof to the centre, as compounded of the endeavours and propensions of all the parts. The accelerating refers to the place of the body in the medium, as the efficacy of the same absolute force, according to divers distances from the centre: and, the absolute force respects the centre or central body itself, as endowed with some power, without which the moving forces are not propagated round about; whether that power or cause be the central body (as the magnet in the centre of the magnetic force, or the earth in the centre of the gravitating force), or be some other thing which does not appear.

Again, forces are either constant or variable.

Constant forces are such as remain and act continually the same for some determinate time. Such, for example, is the force of gravity, which acts constantly the same upon a body while it continues at the same distance from the centre of the earth, or from the centre of force, wherever that may be.

Here the following nine propositions will often be of utility:

1. If different forces are successively applied to accelerate equal quantities of matter from quiescence, the spaces described in any given time will be in the same proportion with the forces.

2. If the same force impels different quantities of matter, for any given time, the spaces described from quiescence will be inversely as the quantities of matter moved.

3. If the force be increased or diminished, in the same proportion with the mass moved, the spaces described from rest, in the same time, will be equal.

4. If a body is moved from quiescence, during any given time, it will, at the end of that time, have acquired such a velocity as will, if continued uniform, carry it, in the same time, through double the space which the body has already described to acquire that velocity.

5. If the same force acts on the same mass, for different times, the velocities generated will be respectively in the same proportion with the times in which the given force acts.

6. If any given quantity of matter is moved from quiescence by different forces, during a given time, the velocities acquired will be in the same proportion with the forces.

7. If a given force impels different quantities of matter for the same time, the velocities generated will be inversely as the quantities of matter.

8. If a body be moved from quiescence, through the same space by different forces, the velocities generated will be in a subduplicate ratio of the forces.

9. If a given quantity of matter is impelled from quiescence, through different spaces, by the action of the same force, the velocities generated will be in a subduplicate ratio of the spaces described.

In the case of a constant force F, acting upon a body b, for any time t, we have these following theorems; putting

f = the constant accelerating force = $F \div b$,
v = the velocity at the end of the time t,
s = the space passed over in that time, by the constant action of that force on the body:

and $\frac{1}{2}g = 16\frac{1}{12}$ feet, the space generated by gravity in 1 second, and calling the accelerating force of gravity 1; then is

$$s = \tfrac{1}{2}tv = \tfrac{1}{2}gft^2 = \frac{v^2}{2gf};$$

$$v = gft = \frac{2s}{t} = \sqrt{2gfs};$$

$$t = \frac{v}{gf} = \frac{2s}{v} = \sqrt{\frac{2s}{gf}};$$

$$f = \frac{v}{gt} = \frac{2s}{gt^2} = \frac{v^2}{2gs}.$$

Variable forces are such as are continually changing in their effect and intensity; such as the force of gravity at different distances from the centre of the earth, which decreases in proportion

as the square of the distance increases. In variable forces, theorems, similar to those above, may be exhibited by using the fluxions of quantities, and afterwards taking the fluents of the given fluxional equations. And herein consists one of the great excellencies of the Newtonian or modern analysis, by which we are enabled to manage, and compute the effects of all kinds of variable forces, whether accelerating or retarding. Thus, using the same notation as above, for constant forces, viz. f the accelerating force at any instant, t the time a body has been in motion by the action of the variable force, v the velocity generated in that time, s the space run over in that time, and $g = 32\frac{1}{6}$ feet; then is

$$\dot{s} = \frac{v\dot{v}}{gf} = v\dot{t};$$

$$\dot{v} = \frac{gf\dot{s}}{v} = gf\dot{t};$$

$$\dot{t} = \frac{\dot{s}}{v} = \frac{\dot{v}}{gf};$$

$$f = \frac{v\dot{v}}{g\dot{s}} = \frac{\dot{v}}{g\dot{t}}.$$

In these four theorems, the force f, though variable, is supposed to be constant for the indefinitely small time $\dot{t}$; and they are to be used in all cases of variable forces, as the former ones in constant forces; viz. from the circumstances of the problem under consideration, deduce a general expression for the value of the force f, at any indefinite time t; then substitute it in one of these theorems, which shall be proper to the case in hand; and the equation, thence resulting, will determine the corresponding values of the other quantities in the problem.

It is also to be observed, that the foregoing theorems equally hold good for the destruction of motion and velocity, by means of retarding or resisting forces, as for the generation of the same by means of accelerating forces.

Forces, central, centrifugal, &c. See the respective words.

Force coercitive, the name given by Coulomb to the resistance opposed by the moleculæ of certain bodies to the motion of the electric fluid, when it endeavours to escape from them. This force augments with the defect of the conducting power.

Force of combination, is that in virtue of which the particles of two or more heterogeneous bodies become so intimately united, that the result of their union is a body which has none of the properties of the constituents.

Force expansive. See Expansion.

Force of torsion, the effort made by a thread or wire, which has been twisted, to return to its former state.

Force projectile. See Projectiles.

FO'RCEDLY. *ad.* (from *force.*) Violently; constrainedly; unnaturally (*Burnet*).

FO'RCEFUL. *a.* (*force* and *full.*) Violent; strong; impetuous (*Pope*).

FO'RCEFULLY. *ad.* (from *forceful.*) Violently; impetuously.

FO'RCELESS. *a.* (from *force.*) Having little force; weak; feeble; impotent.

FORCEPS. (*forceps, -cipis, quasi ferriceps*, as being the iron with which we seize any thing hot, from *ferrum*, iron, and *capio*, to take.) A surgical instrument with which extraneous bodies or other substances are extracted: also an instrument used occasionally by men midwives to bring the head of the fetus through the pelvis.

FO'RCER. *s.* (from *force.*) 1. That which forces, drives, or constrains. 2. The embolus of a pump working by pulsion (*Wilkins*).

For an account of Trevithick's temporary forcer to produce a constant stream, consult Nicholson's Journal, No. 9. N. S., or Gregory's Mechanics, vol. ii. p. 197.

FORCHEIM, a strong town of Franconia, in the bishopric of Bamberg. It is seated at the confluence of the Wisent and Rednitz. Lat. 49. 44 N. Long. 11. 2 E.

FO'RCIBLE. *a.* (from *force.*) 1. Strong; mighty (*Milton*). 2. Violent; impetuous (*Prior*). 3. Efficacious: active; powerful (*Bacon*). 4. Prevalent; of great influence (*Raleigh*). 5. Done by force; suffered by force (*Swift*). 6. Valid; binding; obligatory.

Forcible entry and detainer. Forcible entry, is a violent actual entry into a house or land, &c. or taking a distress of any person, armed, whether he offer violence or fear of hurt to any there, or furiously drive any out of the possession; if one enter another's house, without his consent, although the doors be open, this is a forcible entry punishable by the law.

And an indictment will lie at common law for a forcible entry, though generally brought on the several statutes against forcibly entry. The punishment for this offence is by fine and imprisonment.

Forcible marriage. If any person shall take away any woman having lands or goods, or that is heir apparent to her ancestors, by force and against her will, and afterwards she be married to him, or to another by his procurement; or defiled; he, and also the procurers, and receivers of such a woman, shall be adjudged principal felons. And by 39 Eliz. c. 9, the benefit of clergy is taken away from the principals, procurers, and accessaries before. And by 4 and 5 Phil. and Mary, c. 8, if any person shall take or convey away any unmarried woman, under the age of sixteen (though not attended with force), he shall be imprisoned two years, or fined, at the discretion of the court; and if he deflower her, or contract matrimony with her without the consent of her parent or guardian, he shall be imprisoned five years, or fined in like manner. And the marriage of any person under the age of twenty-one, by licence, without such consent, is void.

FO'RCIBLENESS. *s.* Force; violence.

FO'RCIBLY. *ad.* (from *forcible.*) 1. Strongly; powerfully (*Tillotson*). 2. Impetuously; with great strength. 3. By violence; by force (*Hammond*).

FORCING, in gardening, the art of raising and producing plants, flowers, and fruits, by means of artificial heat. It is accomplished, either by the gentle moist heat that is evolved

during the fermentation and decomposition of stable dung, tanner's bark, and other similar materials, or by the use of actual fire in stoves, flues, and other contrivances for the purpose.

The former of these methods is principally employed in raising cucumbers, melons, and some other fruits, and the latter in producing pine apples, various kinds of wall fruits, and several other sorts of vegetable productions. The great difficulty in the management of this process, is that of adapting and regulating the heat, of whatever sort it may be, in such a manner as to promote and bring forward the plants in the most perfect and healthy growth, without their sustaining injury either by a deficiency or excess. The various methods of effecting this in the most perfect manner are fully described under the culture of the different trees, plants, and vegetables that require such treatment in their cultivation. It is by this process that different sorts of vegetable productions, fruits, and flowers are afforded at much earlier periods than could otherwise be the case, and it of course constitutes an important branch of practical gardening.

Forcing frame, that kind of large framework or erection which is made use of in procuring different sorts of vegetables, fruits, and flowers at an early period, by the application of artificial heat in some of the above modes. It is a construction covered with sloping glass sliding frames on the top, and sometimes in the front. It may be either fixed or moveable; but in the former case the walls are mostly made of brick-work.

These sorts of forcing frames are usually placed full to the south sun, and the length may be from ten to fifty, or one hundred feet; the width from five to fifteen, and from five to ten high; having an upright back wall of wood, where small, but where large, of brick; and a front of glass-work, made sometimes in one continued range of slope to the top of the back wall; and sometimes with upright glass-work, head high, ranging immediately along the front, and from the top of which a glass roof is carried to the top of the back or main wall: when wrought by dung heat, it is chiefly applied against the outside of the back wall, and by being formed into a bed internally; when by bark heat, by forming it into a bed in a pit within side; and when by fire heat, by having several returns of flues against the inside of the back wall, and that of the front and both ends, for the heat to pass along, constructed according to the sorts of plants chiefly intended to be forced, and the nature of the materials to be employed in producing the heat.

Where the first kind of materials is employed in affording heat, the frame is usually formed with an upright back and ends of deal planking, and a sloping front of moveable glass lights; the length may be ten, twenty, or thirty feet, or more; the width from three to five (or more), and five or six high; the frame-work should be of inch and half deal planking, tongued, and closely joined, that no steam from the dung may penetrate into the frame; raised five, six, or seven feet high behind, and only ten or twelve inches high in front, raising both ends answerable to the front and back; the glass work to range, from the upright in front, sloping upward towards the back wall, to about a foot width at top, there resting the ends upon proper frame work of wood; and bars or bearers, three inches in width, ranged sloping from the back to front, for the support of the lights, as in common hot-bed frames, and the top of all boarded wind and water tight; having sometimes withinside two or three ranges of narrow shelves, along the back and ends, for pots of small plants, and the bottom levelled, on which to place pots of larger kinds; or shelves may be made, rising one above another, quite from the front, half way up the back wall, in order to place the lowest plants in front, the others in order behind them, rising gradually to the tallest in the back rows.

In working these frames, after having placed the pots of plants in regular order, the lights are put on, and a sufficient quantity of fresh, hot, stable dung, prepared as for common dung hot beds, is to be piled up close against the outside of the back and ends, a yard wide at bottom, drawing it gradually into a foot width at top, finishing it somewhat sloping, to throw off wet; and as the dung settles or sinks down, a fresh supply must be added at top, to maintain the lining to the full height of the frame, additions being occasionally made of fresh dung, as the heat declines; by this means a fine growing heat will be thrown in. See Hot bed.

Where bark is made use of in producing heat, the frame may be constructed either of wood or brick work, and fronted, &c. with sashes of glass as the former; the length may be ten, twenty, or thirty feet, or more; eight or ten wide, and six or eight high; and, like the dung heat frame, be six or eight feet high behind, and one in front, the ends conformable and sloping, having glass work frames raised from the front, sloping either quite to the top of the back wall, or inclined only about one half towards that part, meeting a tiled roof at top half way, which should be raised high enough in front to throw the water off behind, as well as to admit as much sun as possible to every part of the frame; it may likewise be constructed with an upright front of glass, head high, and a sloping roof of glass work, ranging from the upright front to the top of the back wall, which is the most eligible form, both for convenience and benefit of the plants; either of which constructions may be erected detached, or against a south wall already built, which will serve for the back, and save some expense; the ends may either be of wood or brick, and should be glazed like the front, &c. and the glass work in every part be made to move on and off, as well as to slide backward and forward, to give air, and perform other necessary work. At one end, near the back wall, a door should be made to enter occasionally at, and withinside,

a pit formed for the bark bed, three feet deep, part sunk, the greater part raised, continued the whole length and width, except about a foot and half alley to pass in to perform the necessary culture, as well as view and gather the produce of the different plants.

The pit within is to be filled with new tan, in order to afford a proper heat for the growth and support of the plants that are to be cultivated. See HOT BED.

Where fire heat is to be employed, the frame must be formed of brick work, at least the back or main wall, for the convenience of having fire flues, and the whole front, &c. be glass like the other sorts; the length may be from twenty to forty or fifty feet, or more, though one fire will not warm more than that length; the width from five or six to twelve or fifteen feet, and eight or ten high. In this case the fire is burned in a furnace behind, at one end or middle, thence communicating the heat by internal flues or funnels running the whole length of the back wall, in three or four returns one above another, and continued in one or two flues in the front. And frames thus constructed may be contrived either of moderate width, for one row of trees only, to range against the back wall, or may be capacious enough to have a range of trained wall trees behind, and some small half or full standards, ranging also from the back to the front, or entirely for standards, especially those of cherries.

Where it is intended to have a narrow frame for only a row of trained trees behind, the width of from four to five or six feet is sufficient, having the back or main wall formed of brick or stone, as just observed, eight or ten feet high, with several flues withinside, returned over each other, running the whole length of the wall; in the front must be a low wall a foot high, on which to lay a plate of timber, and from which are ranged glass frames or lights in one continued slope to the top of the back wall, there received into proper frame work; but, for the greater convenience, the lights may be in two tiers or ranges, an under and upper tier, the upper range made to slide up and down over the others, but so that all the glass work can be moved away occasionally, to admit the full air to the trees after the work of forcing is over: the whole bottom space within the frame should be of good loamy earth, or any good garden mould, two spades deep, which should be dug or trenched in the common way; then a range of trees planted behind, towards the wall, two or three yards asunder, erecting a trellis behind them, upon which to train the branches, as against a wall or espalier. Other inferior plants may likewise be set in the border, or in pots, in front of the trees.

In forcing frames of this construction, from forty or fifty feet long may be sufficient; but if longer, two furnaces for fires are necessary. See HOT HOUSE.

Different sorts of frames of this nature may be seen in the plates on forcing frames, hot houses, &c.

In the first description of forcing frame, various kinds of fruits may be produced both of the dwarf fruit tree, and other sorts, as well as different sorts of vegetables and plants of the flowery and other kinds.

Frames of this sort may have such dimensions as to have substantial hot beds prepared within them, for the purpose of receiving many different sorts of potted plants.

And in the second sort of frame, from the heat being more regular and lasting, a still greater variety of the finer sorts of fruits, and the more tender flowers and other vegetable productions, may be produced, not only long before they could be raised in any other way, but with much greater ease and convenience, as well as with greater certainty.

The last kind of forcing frame is employed in furnishing many of the finer sorts of fruits, that require high degrees of heat to produce them in the utmost perfection, such as pine-apples, grapes, apricots, peaches, nectarines, and various others, as well as many tender sorts of vegetables, and numerous plants of the curious flower and other kinds.

FORCING GROUND, the portion of ground in a garden that is destined to the purpose of forcing or raising vegetable productions by means of artificial heat. Grounds of this sort should always be detached from the garden, and situated as near to the stable as the nature of the land will admit, in order that dung may be conveyed to them with as much ease and convenience as possible, litter prevented, and the disagreeable appearance of the beds concealed.

It is necessary in most situations, and particularly in such as are exposed, to have them inclosed with a fence, either of brick work or paling, six or eight feet in height. They should have sufficient space for containing a suitable number of frames and pits, and such linings as may be necessary in the working of them. And it is of great advantage in raising many sorts of tender crops, both of the vegetable and fruit kind, to have four or six feet borders made round them in a raised manner. Where melons are raised, it is usual to have brick pits coped with stone or wood. Those which are most convenient, according to Mr. Forsyth, are such as are about twelve feet in width, and two and a half in depth; the length in proportion to the number of frames employed. They are, however, often made of much smaller dimensions, especially where the extent of forcing ground is but small.

In regard to the size of the lights for early melons, the above author advises, that they should be five feet in length, and three in breadth; and for others six feet in length, and four in breadth, the former being four, and the latter three light boxes. See FRAME.

In constructing the pits, nine inch walls will be sufficient, square spaces of wood being

built in the upper parts of them, where wood copings are made use of, to nail them to. As wood decays rapidly, stone should be preferred. Sometimes the walls are not built solid, but square openings left, so as to admit the heat from the outsides.

Mr. Forsyth directs, that there "should be a walk between the ridges, about six or seven feet broad, sufficient to admit a cart to carry dung," as being more expeditious than wheeling it in.

"The wak should be made up as high as the coping, and sloping gently towards each end," being laid in the bottom with brick rubbish, and covered over with sea coal ashes or sand. By this means, after the linings are made up, it may be kept perfectly neat and clean. A loose drain will likewise be necessary in the middle of the bottom of the pit, for conveying off wet and the oozing from the dung, to a tank or cistern constructed for its reception. The fluid thus collected may be made use of in watering cabbage and other plants of the same kind.

FORCING PIT, a sort of pit constructed of brick work, with fire flues, in various ways, for the purpose of making tan or other hot beds in, being covered with glass frames.

It is useful for receiving different sorts of tender potted plants which require considerable degrees of heat in their cultivation.

FORCING WALL, a wall constructed with flues for the purpose of conveying and communicating fire heat, in order to ripen various kinds of tree fruits that are planted and trained against them, and which are protected in the front by glazed frames.

Walls of this sort should always be erected in warm sheltered situations, and have southern aspects, in order that they may derive the greatest possible advantage from the influence of the sun.

FO'RCIPATED. *a.* (from *forceps.*) Formed like a pair of pincers to open and enclose (*Derham*).

FORD. *s.* (ꝼoꞃꝺ, Saxon.) 1. A shallow part of a river where it may be passed without swimming (*Fairfax*). 2. The stream; the current (*Milton*).

To FORD. *v. a.* (from the noun.) To pass without swimming (*Raleigh*).

FO'RDABLE. *a.* (from *ford.*) Passable without swimming (*Raleigh*).

FORDINGBRIDGE, a town in Hampshire, with a market on Saturdays. Lat. 50. 56 N. Lon. 1. 49 W.

FORDOUN (John of), the father of Scottish history, flourished in the reign of Alexander III. towards the end of the 13th century. But of his life there is nothing known with certainty, though there was not a monastery that possessed not copies of his work. The first five books of the history which bears his name were written by him: the rest were fabricated from materials left by him, and from new collections by different persons. A manuscript in vellum of this historian is in the library of the university of Edinburgh.

FORDWICH, a member of the town and port of Sandwich in Kent, seated on the river Stour, and governed by a mayor, jurats, and commonalty. It is noted for its excellent trouts, and lies three miles N. E. of Canterbury.

FORDYCE (David), an ingenious writer, born at Aberdeen in 1720. He was educated at that university, and became professor of moral philosophy in the Mareschal college. On his return to England from a tour through several parts of Europe, he was shipwrecked and drowned in 1751. He wrote; 1. Dialogues concerning Education, 2 vols. 8vo. 2. A Treatise of moral Philosophy in Dodsley's Preceptor. 3. Theodorus, a Dialogue, concerning the Art of Preaching.

FORDYCE (Dr. James), a noted divine, was brother of the preceding, and born also at Aberdeen in the same year: he was educated at that university. Early in life he was settled minister of the parish of Brechin, and became very celebrated as a preacher. After a few years he received a presentation to the church of Alloa, near Stirling. About the year 1760 he preached before the General Assembly of the Church of Scotland, a fine sermon on the folly, infamy, and misery, of unlawful pleasure, which raised his fame as a pulpit orator so high, that the university of Glasgow soon after sent him a diploma, creating him D. D.; and, which was more extraordinary, he received an invitation from a very respectable congregation of protestant dissenters, meeting in Monkwell-street, London; this invitation he accepted. About 13 years previous to his death, the doctor's ill health obliged him to resign this charge; and he retired to a village in Hampshire. He died at Bath, Oct. 1. 1796. His most noted works are, Sermons to Young Women, 2. vols. Addresses to Young Men, 2 vols. and Addresses to the Deity, 1 vol. His Sermons to young women have attracted most general notice; but, for our own part, we do not perceive in them many excellencies. Had we been so fortunate as to hear them from the pulpit, we conclude we *must* have admired them, for Dr. Fordyce was qualified to excel as a preacher. The effect of his pulpit addresses was much heightened, not only by an action and an elocution, which he studied with care and practised with success; but by the figure of his person, which was peculiarly dignified, and by the expression of his countenance, which was animated at all times, but animated most of all when lighted up by the ardor of his soul in the service of God. By some of his hearers, it was observed that, on many occasions, he seemed not merely to speak, but to look conviction to the heart. His eye, indeed, was particularly bright and penetrating, and he had carefully attended to the effect which an orator may often produce upon an audience by the judicious use of that little, but invaluable organ.

FORE. *a.* (ꝼoꞃe, Saxon.) 1. Anteriour;

not behind (*Bacon*). 2. That is first in a progressive motion (*Cheyne*).

FORE. *ad.* 1. Anteriourly. (*Raleigh*). 2. *Fore* is a word much used in composition to mark priority of time.

FORE AND AFT, is used by seamen for the whole ship's length, or from end to end.

FORE-LEGS OF A HORSE, the fore-leg consists of the arm, fore-thigh, and shank, which should be large, broad, and nervous.

FORE-SKIN. See PREPUCE.

To FOREADVI'SE. *v. n.* (*fore* and *advise.*) To counsel early; to counsel before the time of action, or the event (*Shakspeare*).

To FOREA'RM. *v. a.* (*fore* and *arm.*) To provide for attack or resistance before the time of need (*South*).

To FOREBO'DE. *v. n.* (*fore* and *bode.*) 1. To prognosticate; to foretell (*Dryden*). 2. To foreknow; to be prescient of (*Pope*).

FOREBO'DER. *s.* (from *forebode.*) 1. A prognosticator; a soothsayer (*L'Estrange*). 2. A foreknower.

FOREBY'. *prep.* (*fore* and *by.*) Near; hard by; fast by (*Spenser*).

To FORECA'ST. *v. a.* (*fore* and *cast.*) 1. To scheme; to plan before execution (*Daniel*). 2. To adjust; to contrive antecedently (*Dryden*). 3. To foresee; to provide against (*L'Estrange*).

To FORECA'ST. *v. n.* To form schemes; to contrive beforehand (*Spenser*).

FORECA'ST. *s.* (from the verb.) Contrivance beforehand; antecedent policy (*Addison*).

FORECA'STER. *s.* (from *forecast.*) One who contrives beforehand.

FO'RECASTLE. *s.* (*fore* and *castle.*) In a ship, is that part where the foremast stands.

FORECHO'SEN. *part.* (*fore* and *chosen.*) Pre-elected.

FORECI'TED. *part.* (*fore* and *cite.*) Quoted before, or above (*Arbuthnot*).

To FORECLO'SE. *v. a.* (*fore* and *close.*) 1. To shut up; to preclude; to prevent. 2. *To* FORECLOSE *a Mortgage*, is to cut off the power of redemption.

FO'REDECK. *s.* (*fore* and *deck.*) The anteriour part of the ship (*Chapman*).

To FO'REDESIGN. *v. a.* (*fore* and *design.*) To plan beforehand (*Cheyne*).

To FOREDO'. *v. a.* (from *for* and *do*, not *fore.*) 1. To ruin; to destroy: obsolete (*Shakspeare*). 2. To overdo; to weary; to harass (*Shakspeare*).

To FOREDO'OM. *v. a.* (*fore* and *doom.*) To predestinate; to determine beforehand (*Pope*).

FORE-E'ND. *s.* (*fore* and *end.*) The anteriour part (*Bacon*).

FOREFA'THER. *s.* (*fore* and *father.*) Ancestor; one who in any degree of ascending genealogy precedes another (*Raleigh*).

To FOREFE'ND. *v. a.* (*for* or *fore* and *fend.*) 1. To prohibit; to avert (*Dryden*). 2. To provide for; to secure (*Shakspeare*).

FOREFI'NGER. *s.* (*fore* and *finger.*) The finger next the thumb; the index (*Brown*).

FO'REFOOT. *s.* plur. *forefeet.* (*fore* and *foot.*) The anteriour foot of a quadruped (*Peacham*).

To FOREGO'. *v. a.* (*fore* and *go.*) 1. To quit; to give up; to resign (*Locke*). 2. To go before; to be past (*Raleigh*). 3. To lose (*Shakspeare*).

FO'REGOER. *s.* (from *forego.*) Ancestor; progenitor (*Shakspeare*).

F'OREGROUND. *s.* (*fore* and *ground.*) The part of the field or expanse of a picture which seems to lie before the figures (*Dryden*).

FO'REHAND. *s.* (*fore* and *hand.*) 1. The part of a horse which is before the rider. 2. The chief part: not in use (*Shakspeare*).

FO'REHAND. *a.* Done too soon (*Shakspeare.*)

FO'REHANDED. *a.* (from *fore* and *hand.*) 1. Early; timely (*Taylor*). 2. Formed in the foreparts (*Dryden*).

FO'REHEAD. *s.* (*fore* and *head.*) 1. That part of the face which reaches from the eyes upward to the hair (*Dryden*). 2. Impudence; confidence; assurance (*Collier*).

FOREHEAD OF A HORSE. This should be somewhat broad; some would have it a little raised; but a flat one is most beautiful. A horse should have in his forehead what is called a feather. (See FEATHER). It is also to be desired that he should have a star or blaze in his forehead.

FOREHO'LDING. *s.* (*fore* and *hold.*) Predictions; ominous accounts (*L'Estrange*).

FO'REIGN. *a.* (*forain*, French; *forano*, Spanish.) 1. Not of this country; not domestic (*Addison.*) 2. Alien; remote; not allied (*Swift*). 3. Excluded; not admitted; held at a distance (*Shakspeare*). 4. (In law.) A foreign plea, *placitum forinsecum*; as being a plea out of the proper court of justice. 5. Extraneous; adventitious in general (*Philips*).

FO'REIGNER. *s.* (from *foreign.*) A man that comes from another country; not a native; a stranger (*Addison*).

It has long been the wise policy of the British government to encourage emigration from foreign countries, with a view to introduce the various manufactures peculiar to them; and perhaps the encouragement to aliens to settle among us ought to be extended and increased, at a moment when some of the most wealthy parts of Europe are a prey to the horrors of war, and when thousands must be anxious to meet with an asylum for themselves, their families, and property.

It appears that there are domesticated among us at present (1807) about 11,400 foreigners, and that 16,000 others are engaged in our various military or naval services, &c., chiefly abroad.

1	Foreign troops in British pay, mostly Germans	12,500
2	Foreigners of different nations, intermixed in our army and navy	3000
3	In the merchant service, as seamen	500
		16,000
4	Emigrant French clergy	250
5	Italians and Swiss	800
6	French	5,000
7	Germans	2,500
8	Dutch	500
9	Americans	700
10	Russians	150
11	Spaniards	300
12	All other nations	1,200
	Total	27,400

Of the class No. 1, above one half are either in Ireland, or abroad on various services.

No. 2, are interspersed in every regiment in the army, and ships of the line.

4. Mostly kept on charity.

5. Mostly vagabonds, travelling the country with images and pictures, and persons escaped from the conscription of France.

6. The greater part are valets, teachers in schools, &c.

7. The greater part are sugar-boilers and other labourers, including above 700 Jews.

8. Mostly employed in trade and commerce. (*Monthly Mag.*)

FO'REIGNNESS. *s.* (from *foreign.*) Remoteness; want of relation to something (*Locke*).

FOREIMA'GINE. *v. a.* (*fore* and *imagine.*) To conceive or fancy before proof (*Camden*).

To FOREJU'DGE. *v. a.* (*fore* and *judge.*) To judge beforehand; to be prepossessed.

To FOREKNO'W. *v. a.* (*fore* and *know.*) To have prescience of; to foresee (*Raleigh*).

FOREKNO'WABLE. *a.* (from *foreknow.*) Possible to be known before they happen (*More*).

FOREKNO'WLEDGE. *s.* (*fore* and *knowledge.*) Prescience; knowledge of that which has not yet happened (*Milton.*)

FORELAND, or FORENESS, in navigation, a point of land jutting out into the sea. In England, there are two promontories or headlands, called North and South Foreland respectively. The former is the N.E. point of the Isle of Thanet in Kent, and is situated in Lon. 1. 17 E. Greenwich, and Lat. 51. 23 N. The latter forms the east point of the Kentish coast, but is called South in respect to its bearing from the former: its Lon. is 1. 17 E. and its Lat. 51. 12 N.

To FORELA'Y. *v. a.* (*fore* and *lay.*) To lay wait for; to entrap by ambush (*Dryden*).

To FO'RELIFT. *v. a.* (*fore* and *lift.*) To raise aloft any anteriour part (*Spenser*).

FORELOCK. *s.* (*fore* and *lock.*) The hair that grows from the forepart of the head (*Milton*).

FO'REMAN. *s.* (*fore* and *man.*) The first or chief person (*Addison*).

FOREMAST *of a ship*, a large round piece of timber, placed in her forepart, or forecastle, and carrying the fore-sail and fore-top-sail yards. Its length is usually ⅞ of the main-mast. And the fore-top-gallant-mast is ½ the length of the fore-top-mast. See MAST.

FOREMAST-MEN, are those on board a ship that take in the top-sails, fling the yards, furl the sails, bowse, trice, and take their turn at the helm, &c.

FO'REMENTIONED. *a.* (*fore* and *mention.*) Mentioned or recited before.

FO'REMOST. *a.* (from *fore.*) 1. First in place (*Sidney*). 2. First in dignity (*Dryden*).

FORENA'MED. *a.* (*fore* and *name.*) Nominated before (*Ben Jonson*).

FO'RENOON. *s.* (*fore* and *noon.*) The time of day reckoned from the middle point, between the dawn and the meridian, to the meridian (*Arbuthnot*).

FORENO'TICE. *s.* (*fore* and *notice.*) Information of an event before it happens (*Rymer*).

FORE'NSIC. *a.* (*forensis*, Latin.) Belonging to courts of judicature (*Locke*).

To FOREORDA'IN. *v. a.* (*fore* and *ordain.*) To predestinate; to predetermine; to preordain (*Hooker*).

FO'REPART. *s.* (*fore* and *part.*) 1. The part first in time (*Raleigh*). 2. The part anteriour in place (*Ray*).

FOREPAST. *a.* (*fore* and *past.*) Past before a certain time (*Hammond*).

FOREPOSSE'SSED. *a.* (*fore* and *possess.*) Preoccupied; prepossessed (*Sanderson*).

FO'RERANK. *s.* (*fore* and *rank.*) First rank; front (*Shakspeare*).

FORE REACH, in the sea language: a ship is said to fore reach upon another, when both sailing together, one sails better, or outgoes the other.

FORERECI'TED. *a.* (*fore* and *recite.*) Mentioned or enumerated before (*Shakspeare*).

To FORERU'N. *v. a.* (*fore* and *run.*) 1. To come before as an earnest of something following (*Dryden*). 2. To precede; to have the start of (*Graunt*).

FORERU'NNER. *s.* (from *forerun.*) 1. A harbinger; a messenger sent before to give notice of the approach of those that follow (*Stillingfleet. Dryden*). 2. A prognostic; a sign foreshowing any thing (*South*).

To FORESA'Y. *v. a.* (*fore* and *say.*) To predict; to prophesy; to foretell (*Shakspeare*).

To FORESE'E. *v. a.* (*fore* and *see.*) To see beforehand; to see what has not yet happened (*Taylor*).

To FORESHA'ME. *v. a.* (*fore* and *shame.*) To shame; to bring reproach upon (*Shakspeare*).

FO'RESHIP. *s.* (*fore* and *ship.*) The anteriour part of the ship (*Acts*).

To FORESHO'RTEN. *v. a.* (*fore* and

shorten.) To shorten figures for the sake of seeing those behind (*Dryden*).

To FORESHO'W. *v. a.* (*fore* and *show.*) 1. To discover before it happens; to predict; to prognosticate (*Denham*). 2. To represent before it comes (*Hooker*).

FO'RESIGHT. *s.* (*fore* and *sight.*) 1. Prescience; prognostication; foreknowledge (*Milton*). 2. Provident care of futurity (*Spenser*).

FORESI'GHTFUL. *a.* (*foresight* and *full.*) Prescient; provident (*Sidney*).

To FORESI'GNIFY. *v. a.* (*fore* and *signify.*) To betoken beforehand; to foreshow; to typify (*Hooker*).

FO'RESKIN. *s.* (*fore* and *skin.*) The prepuce (*Cowley*).

FO'RESKIRT. *s.* (*fore* and *skirt.*) The pendulous or loose part of the coat before (*Shakspeare*).

To FORESLA'CK. *v. a.* (*fore* and *slack.*) To neglect by idleness (*Spenser*).

To FORESLO'W. *v. a.* (*fore* and *slow.*) 1. To delay; to hinder; to impede (*Dryden*). 2. To neglect; to omit (*Fletcher*).

To Foreslo'w. *v. n.* To be dilatory; to loiter (*Shakspeare*).

To FORESPE'AK. *v. n.* (*fore* and *speak.*) 1. To predict; to foresay (*Camden*). 2. To forbid. (*Shakspeare*).

FORESPE'NT. *a.* (*for* and *spent.*) 1. Wasted; tired; spent (*Shakspeare*). 2. Forepassed; past. (*fore* and *spent.*) (*Spectator*). 3. Bestowed before (*Shakspeare*).

FORESPU'RRER. *s.* (*fore* and *spur.*) One that rides before (*Shakspeare*).

FOREST, in geography, a huge wood; or a large extent of ground covered with trees. The word is formed of the Latin *foresta*, which first occurs in the capitulars of Charlemagne, and which itself is derived from the German *frost*, signifying the same thing. Spelman derives it from the Latin *foris restat*, by reason that forests are out of towns. Others derive *foresta* from *feris*, q. d. *Foresta, quoad sit tuta statio ferarum*, as being a safe station or abode for wild beasts. The Caledonian and Hercynian forests are famous in history. The first was a celebrated retreat of the ancient Picts and Scots: the latter anciently occupied the greatest part of Europe; particularly Germany, Poland, Hungary, &c.

Forest, in law, is defined by Manwood a certain territory of woody grounds and fruitful pastures, privileged for wild beasts and fowls of forest, chase, and warren, to rest and abide under the protection of the king, for his princely delight; bounded with unremoveable marks and meres, either known by matter of record or prescription; replenished with wild beasts of venery or chase, with great coverts of vert for the said beasts; for preservation and continuance whereof, the vert and venison, there are certain particular laws, privileges, and officers. Forests are of such antiquity in England, that, excepting the New-Forest in Hampshire, erected by William the Conqueror, and Hampton-Court, erected by Henry VIII. it is said, that there is no record or history which makes any certain mention of their erection.

Forest (Beasts of the), are the hart, hind, buck, doe, boar, wolf, fox, hare, &c.

Forest-courts, courts instituted for the government of the king's forests in different parts of the kingdom, and for the punishment of all injuries done to the king's deer or venison, to the vert or greensward, and to the covert in which such deer are lodged.

Forest-laws, are peculiar laws different from the common law of England. Even to this day, in trespasses relating to the forest, *voluntas reputabitur pro facto*; so that if a man be taken hunting a deer, he may be arrested as if he had taken a deer.

Forest-towns, in geography, certain towns of Suabia in Germany, lying along the Rhine, and the confines of Switzerland, and subject to the house of Austria. Their names are Rhinefield, Seckingen, Lausenburg, and Waldshut.

Forests (Plantation of). This of late has been too much neglected in our own country; whence the high and enormous price of timber of every kind, and the extreme difficulty of obtaining it during war. Even those who are possessed of extensive tracts of woodlands are more generally disposed to convert them into arable than to maintain them upon their existing use. It is a national evil; but will always be found to accompany a population that demands a larger proportion of grain than the soil actually cultivated produces, and where landed estates are perpetually flitting from hand to hand.

The trees that answer best for fresh plantation are such as grow to a large size, and lofty height, whether deciduous or evergreen: those chiefly employed are the oak, ash, elm, beech, chesnut, maple, birch, alder, poplar, larch, and pine. Many of these are as ornamental as they are useful, and where ornament is principally the object, they may be intermixed with mountain-ash, lime, horse-chesnut, willow, and all the varieties of fir, box, holly, yew, cypress and cedar.

In forming plantations of this kind, the following rules may be found useful.

Great care should, in the first place, be taken to adapt the trees as much as possible to the soils and situation, as some sorts succeed best on a soil of one kind, and other sorts on a soil of another kind. Thus the oak, elm, maple, and birch, answer well on all the deeper kinds of soil; while those of the ash, beech, chesnut, mountain-ash, larch, pine, box, holly, and yew thrive most perfectly where the soils are light, dry and friable; at the same time that the alder, willow, and poplar demand a soil where there is a considerable degree of moisture; and the beech, mountain-ash, and larch succeed well in exposed situations.

The manual labour required in laying out a forest, is nearly the same as that for fruit trees and shrubs; and though plantations of forest trees need not be so nicely attended to as fruit

trees, yet the better the work is performed, the fairer is the prospect in growing good timber: a check by an error at first planting is a loss of time, and a damage done to trees which is sometimes never recovered. To give an instance: the mould is often thrown on the roots of a forest tree in lumps, when if a little sifted earth was used, so as just to cover them with fine mould, the trouble would be amply repaid by the quick striking, and future strength of the tree.

Ground designed for planting should be prepared as long as it can beforehand, by the use of the plough or spade; and if some sort of previous cultivation, either in corn or vegetables, was adopted, the soil would be better fitted to receive the trees. At any rate, the places where the trees are to be set should be previously dug somewhat deep, and cleared of rubbish, perennial weeds, couch, &c. If wet, let it be properly drained, for none but aquatics can do well in a cold and very moist soil.

In open planting for timber, to make only the holes good where the trees are set, is sufficient, if the soil be not strong (which, generally speaking, however, it should be); and in such plantations, the plough being used for corn, or some sort of crop to be carried off, the whole soil will be prepared for the tree's roots to spread. A plantation of this sort may be constantly under the plough, till the trees shade too much; and then it may be sown down for grass, which lying warm, and coming early, would be found useful. The opportunity given to improve a soil by this cultivation would insure very fine timber. But a plantation of trees being made (as suppose of oaks) at due distances, and the ground ploughed for two or three years, while they get a little a head, then it might be sown profitably with nuts, keys, and seeds for underwood, observing to thin the plants the second year, and again the third, till two or three feet asunder in poor ground, and to three or four feet distance if rich. In fourteen or fifteen years (or much sooner for some purposes), the ash poles, &c. will be fine, and meet with a ready sale as useful stuff: afterwards the underwood will be fit to cut, in a strong state, every eleven or twelve years. In the management of underwood, some have thinned the plants while young, to three feet asunder, and cut them down at three years, to about six inches, in order to form stools, which in about ten years are cut, having produced several stems from each. Some persons have cut seedling trees down at this age to three inches for timber, leaving only one strong shoot to grow from each stool; and thus finer trees are frequently (or rather certainly) produced, than from seedlings not cut down. The distances of the timber plants may be from twenty-five to thirty-five feet, according to the soil, or opinion of the planter. If no view to underwood, the above open planting may be made close, by setting first the principals (which should be fine plants), and then filling up with others that are worse, to within about eight or nine feet of one another. They will at this distance come to fair timber, or may be thinned at pleasure; and even among these, a small crop of underwood might be had, which would shelter the timber plants, and help to draw them up straight.

As to little plantations, of thickets, coppices, clumps, and rows of trees, they are to be set close according to their nature, and the particular view the planter has, who will take care to consider the usual size they attain, and their mode of growth. An advantage at home for shade or shelter, and a more distant object of sight, will make a difference. For some immediate advantage, very close planting may take place, but good trees cannot be thus expected; yet if thinned in time, a straight tall stem is thus procured, which afterwards is of great advantage.

For little clumps or groups of forest trees (as elms), these may be planted three or four in a spot, within five or six feet of one another, and thus be easily fenced; having the air freely all round, and a good soil, such clumps produce fine timber.

Single trees of every sort grow off apace, and are more beautiful than when in the neighbourhood of others, and particularly firs, pines, larches, limes, walnuts, and chesnuts: the edible fruited chesnut is exceedingly good for timber; but the horse is only ornamental, flourishing most on high dry ground. As to rows of trees, whether single or double, when planted for a screen, they may be set about seven or eight feet asunder, upon an average, according to their nature, taking care to prune them occasionally from too galling an interference.

Avenues are now seldom planted; but when they are, two good rows of elms, limes, chesnuts, &c. should be set at the width of the house, at full thirty feet distance in the rows: to thicken which, intermediate plants may be set; and also an inner row, to be removed when the principal trees are full grown. Avenues to prospects should be fifty or sixty feet wide. The best season for planting deciduous kinds of forest trees is toward the end of October, and for evergreen sorts, the end of March; though the soil, whether light and dry, or heavy and wet, should somewhat direct; evergreen trees being to be planted generally with safety, early in autumn, if the soil is warm; but in all cases trees should be planted in dry weather, that the mould may be loose to drop in, and lie close between the roots, which is a material thing: trees planted in rain or mists are injured by the moisture moulding the roots.

Forest trees for planting are generally preferred rather large, and being so, should not be taken up carelessly, but with as much of an uninjured spread of roots as possible; yet free growing plants, of about three or four feet high, promise in the end to make finer trees than those that are planted larger. Some say they are best at this size from the seed bed; and others, to have been once planted out, having had their tap roots then cut: and generally

speaking, this is the case, as they have a more bushy and horizontal root. In the act of planting, let every thing be done as for fruit trees; i. e. the hole dug wide and deep, the ground well broken, or rather sifted, to lie immediately about their roots, &c. Let the trees be made fast by stakes, and litter laid about their roots to keep out frost and drought. It is of much consequence to take care that the roots (especially of evergreen trees) do not get withered before planted. Evergreens do best in a dry, but deciduous forest trees (generally) in a moist soil, if it is not wet. Oaks in particular, though at first they may appear to do poorly, grow well in strong moist ground, and make the best timber.

Fencing is the last thing to be considered. If trees be planted where cattle go, their stems must be protected from barking and rubbing. The common way of small posts and little rails is well known; but if large cattle be not fed where the trees are, good thorns stuck round them, and tied to them, are sufficient, and indeed this might do in almost all cases. There are various ways, ordinarily known; but whatever mode is used, let it be at first well executed, and afterwards repaired in time, as often as there is need.

Whoever plants forest trees, should take care to dress them by proper pruning, and suffering no suckers to remain about their roots. Their tops should be kept equal, and not permitted to spread too much in heavy branches, but trained in a light and spiral way, always preserving the leading shoot, to encourage mounting, which is the perfection of a forest tree. The stems of all trees designed for timber should be constantly and timely attended to, as it is necessary to rub off buds, or cut off the side shoots, except here and there a small one, which may serve to detain the sap to the swelling of the trunk; but branches being left on of any strength, keep the tree from mounting, and draw it crooked; and such branches, if cut off when large, occasion knots, and sometimes decay at the part.

Plantations growing thick should be thinned in time, but not too much at once, especially in hilly situations; for those trees which remain come suddenly to be exposed (after having been brought up under the shelter of others), and suffer much; getting crooked, stunted, and bushy, instead of having their desirable form, without which they are not adapted for superior uses, or agreeable to the eye.

Ornamental trees, as the crab, black cherry, mountain ash, &c. may prove profitable, as well as agreeable, one being here and there scattered amongst forest trees, and should therefore not be omitted: the wood is good.

FORE-STAFF, an instrument used at sea, for taking the altitudes of the heavenly bodies; being so called, because the observer, in using it, turns his face forward, or towards the object, in contradistinction to the back-staff, with which he turns his back to the object. It is also called the cross-staff, because it consists of several pieces set across a staff.

The fore-staff is formed of a straight square staff, of about three feet long, having each of its four sides graduated like a line of tangents, and four crosses, or vanes, sliding upon it, of unequal lengths, the halves of which represent the radii to the lines of tangents on the different sides of the staff. The first or shortest of these vanes is called the ten cross, or ten vane, and belongs to the 10 scale, or that side of the instrument on which divisions begin at 3 degrees, and end at 10. The next longer cross is called the 30 cross, belonging to that side of the staff where the divisions begin at 10 degrees, and end at 30, called the 30 scale. The third vane is called the 60 cross, and belongs to that side where the divisions begin at 20 degrees, and end at 60. The last or longest vane, called the 90 cross, belongs to the side where the divisions begin at 30 degrees, and end at 90.

The chief use of this instrument is to take the height of the sun, and stars, or the distance between two stars; and the 10, 30, 60, or 90 cross, is to be used, according as the altitude is more or less; that is, if the altitude be less than 30, the 30 cross is to be used; and so on.

To observe an Altitude with the Forestaff. Apply the flat end of the staff to the eye, and slide one of the crosses backwards and forwards upon it, till over the upper end of the cross be just seen the centre of the sun or star, and over the under end the extreme horizon; then the degrees and minutes cut by the cross on the side of the staff proper to the vane in use, gives the altitude above the horizon.

In like manner, *for the distance between two luminaries*; the staff being set to the eye, bring the cross just to subtend or cover that distance, by having that luminary just at the one end of it, and the other luminary at the other end of it; and the degrees and minutes, in the distance, will be cut on the proper side of the staff, as before.

To FORESTA'LL. *v. a.* (fopeſtallan, Sax.) 1. To anticipate; to take up beforehand. 2. To hinder by preoccupation or prevention (*Pope*). 3. To seize or gain possession of before another (*Spenser*).

FORESTA'LLER. *s.* (from *forestall.*) One that anticipates the market; one that purchases before others to raise the price (*Locke*).

FORESTALLING, is the buying or bargaining for any corn, cattle or other merchandize, by the way, before it comes to any market or fair, to be sold; or by the way, as it comes from beyond the seas, or otherwise, towards any city, port, haven, or creek of this realm, to the intent to sell the same again at a higher price.

At the common law, all endeavours to enhance the common price of any merchandize, and all things which have an apparent tendency thereto, whether by spreading false rumours, or by purchasing things in a market before the accustomed hour, or by buying and selling

again the same thing in the same market, or by any other such like devices, are highly criminal, and punishable by fine and imprisonment.

Several statutes have, from time to time, been made against these offences in general, which were repealed by 12 Geo. III.

But though these offences are no longer combated by the statutes, they are still punishable upon indictment at the common law, by fine and imprisonment.

FORESTBO'RN. *a.* (*forest* and *born.*) Born in a wild (*Shakspeare*).

FO'RESTER. *s.* (*forestier*, French.) 1. An officer of the forest (*Shakspeare*). 2. An inhabitant of the wild country.

FO'RESWAT. Fo'reswart. *a.* (from *fore* and *swat*, from *sweat.*) Spent with heat *Sidney*).

To FORETA'STE. *v. a.* (*fore* and *taste.*) 1. To have antepast of; to have prescience of. 2. To taste before another (*Milton*).

Fo'retaste. *s.* Anticipation of (*South*).

To FORETE'LL. *v. a.* (*fore* and *tell.*) 1. To predict; to prophesy (*Dryden*). 2. To foretoken; to foreshow.

To Forete'll. *v. n.* To utter prophesy.

FORETE'LLER. *s.* (from *foretell.*) Predicter; foreshower (*Boyle*).

FORETHIGH, a name denoting the arm of a horse.

To FORETHI'NK. *v. a.* (*fore* and *think.*) 1. To anticipate in the mind; to have prescience of (*Raleigh*). 2. To contrive antecedently (*Hall*).

To Forethi'nk *v. n.* To contrive beforehand (*Smith*).

FORETHO'UGHT. *s.* (from *forethink.*) 1. Prescience; anticipation (*L'Estrange*). 2. Provident care.

To FORETO'KEN. *v. a.* (*fore* and *token.*) To foreshow; to prognosticate as a sign (*Daniel*).

Foreto'ken. *s.* (from the verb.) Prevenient sign; prognostic (*Sidney*).

FORETO'OTH. *s.* (*fore* and *tooth.*) The tooth in the anteriour part of the mouth; the incisor (*Ray*).

FO'RETOP. *s.* (*fore* and *top.*) That part of a woman's headdress that is forward, or the top of a periwig (*Dryden*).

FOREVO'UCHED. *part.* (*fore* and *vouch.*) Affirmed before; formerly told (*Shakspeare*).

FO'REWARD. *s.* (*fore* and *ward.*) The van; the front (*Maccabees*).

To FOREWA'RN. *v. a.* (*fore* and *warn.*) 1. To admonish beforehand (*Luke*). 2. To inform previously of any future event (*Milton*). 3. To caution against any thing beforehand.

To FOREWA'STE. *v. a.* (*fore* and *waste.*) To desolate; to destroy: out of use (*Spenser*).

To FOREWI'SH. *v. n.* (*fore* and *wish.*) To desire beforehand (*Knolles*).

FOREWO'RN. *part.* (*fore* and *worn*, from *wear.*) Worn out; wasted by time or use (*Sidney*).

FOREZ, a late province of France, bounded on the W. by Auvergne, on the S. by Velay and the Vivarais, on the E. by the Lyonnois, and on the N. by Burgundy and the Bourbonnois. It is watered by the Loire, and several other streams, and has several mines of coal and iron. It now forms, with the Lyonnois, the department of Rhone and Loire.

FORFAR, the county town of Angus-shire. It contains many neat houses. Lat. 56. 35 N. Lon. 2. 54 W.

FORFARSHIRE. See Angus-shire. Part of the Grampian mountains runs through this county. The population of this county amounted to 68,297 in the year 1755, and to 97,778 in the year 1801.

FO'RFEIT. *s.* (*forfait*, French.) 1. Something lost by the commission of a crime; a fine; a mulct (*Waller*). 2. A person obnoxious to punishment (*Shakspeare*).

To Fo'rfeit. *v. a.* (from the noun.) To lose by some breach of condition; to lose by some offence (*Davies. Boyle*).

Fo'rfeit. *part. a.* (from the verb.) Liable to penal seizure; alienated by a crime (*Pope*).

FO'RFEITABLE. *a.* (from *forfeit.*) Possessed on conditions, by breach of which any thing may be lost.

FO'RFEITURE. *s.* (*forfaiture*, French.) 1. The act of forfeiting. 2. The thing forfeited; a mulct; a fine.

Forfeiture, is a punishment annexed by law to some illegal act or negligence in the owner of lands, tenements, or hereditaments, whereby he loses all his interest therein, and they go to the party injured, as a recompense for the wrong which either he alone or the public together have sustained. (2 *Blackstone*, 267).

The offences which induce a forfeiture of lands and tenements are principally the following: treason, felony, misprision of treason, præmunire, drawing a weapon on a judge, striking any one in the presence of the king's court of justice, and popish recusancy, or non-observance of any certain laws, enacted in restraint of papists.

By the common law, all lands of inheritance of which the offender is seised in his own right, and also all rights of entry to lands in the hands of a wrong-doer, are forfeited to the king on an attainder of high treason, although the lands are holden of another; for there is an exception in the oath of fealty, which saves the tenant's allegiance to the king; so that if he forfeits allegiance, even the lands he held of another lord, are forfeited to the king, for the lord himself cannot give of lands, but upon that condition. (*Co. Lit.* 8.)

Also upon an attainder of petit treason or felony, all lands of inheritance of which the offender is seised in his own right, as also all rights of entry to lands in the hands of a wrong-doer, are forfeited to the lord of whom

they are immediately holden: for this by the feudal law was deemed a breach of the tenant's oath of fealty in the highest manner; his body with which he had engaged to serve the lord, being forfeited to the king, and thereby his blood corrupted, so that no person could represent him; and all personal estates, whether they are in action or possession, which the party has or is entitled to, in his own right, and not as executor or administrator to another, are liable to such forfeiture in the following cases:

1st. Upon a conviction of treason or felony. But the lord cannot enter into the lands holden of him upon an escheat for petit treason or felony, without a special grant, till it appears by due process that the king has had his prerogative of the year, day, and waste. (*Stanf.* P.C. 191.

As to forfeiture of goods and chattels, it seems agreed that all things whatever, which are comprehended under the notion of a personal estate, are liable to such forfeiture.

2d. Upon a flight found before the coroner, on view of a dead body.

3d. Upon an acquittal of a capital felony, if the party is found to have fled. 2 Haw. 450.

4th. If a person indicted of petit larceny and acquitted, is found to have fled for it, he forfeits his goods as in cases of grand larceny. 2 Haw. 451. But the party may in all cases, except that of the coroner's inquest, traverse the finding of the flight; and it seems agreed that the particulars of the goods found to be forfeited may also be traversed.

5th. Upon a presentment by the oaths of twelve men, that a person arrested for treason or felony fled from, or resisted those who had him in custody, and was killed by them in the pursuit or scuffle. Id.

6th. If a felon waive, that is, leave any goods in his flight from those who either pursue him, or are apprehended by him so to do, he forfeits them, whether they are his own goods, or goods stolen by him; and at common law, if the owner did not pursue and appeal the felon, he lost the goods for ever: but by 21 H. VIII. c. 11, for encouraging the prosecution of felons it is provided, that if the party comes in as evidence on the indictment, and attaints the felon, he shall have a writ of restitution. 4 Inst. 134.

7th. If a man is felo de se, he forfeits his goods and chattels. 5 Co. 109.

8th. A convict within clergy, forfeits all his goods, though he may be burnt in the hand, yet thereby he becomes capable of purchasing other goods. But, on burning in the hand, he ought to be immediately restored to the possession of his lands. 2 H. 388, 389.

The forfeiture upon an attainder of treason or felony, shall have relation to the time of the offence for the avoiding all subsequent alienation of the lands; but to the time of conviction, or fugam fecit found, &c. only as to chattels, unless when the party was killed in flying from, or resisting those who had arrested him: in which case it is said that the forfeiture shall relate to the time of the offence. Plowd. 488.

Forfeiture in civil cases. A forfeiture of copyhold by felling timber, was relieved in equity; but the lord-keeper declared, that in case of a wilful forfeiture he would not relieve. Chan. Cas. 96. In case of a forfeiture equity can relieve, where they can give satisfaction. 1 Salk. 156.

Forfeiture of marriage, a writ which anciently lay against him, who by holding knight's service, and being under age, and unmarried, refused her whom the lord offered him without his disparagement, and married another. F. N. B. 141.

FORFEND. *v. a.* To prevent; to forbid.

FORFEX (quasi *ferifex.*) The same as forceps.

FORFI'CULA. Ear-wig. In zoology, a genus of the class insecta, order coleoptera: antennas setaceous; feelers unequal, filiform; shells half as long as the abdomen; wings folded up under the shells; tail armed with a forceps. Eighteen species, chiefly inhabitants of Europe and America; two found in our own country; F. auricularia, and F. minor. It is sufficient to describe the first, which is of a dark chesnut colour; forceps curved, toothed at the base; antennas with fourteen joints. Very common in wet ground, ripe fruit, and old wood; and has been occasionally found to creep into the ears of such as sleep in the open air: when it is easily destroyed by dropping into the ear either a little oil or spirits, or both. The eggs are white, and oval, and large for the size of the insect; they are found deposited in damp situations, and generally under stones. The parent is more provident of the young larves than insects generally are, brooding over them for several hours in the day, after the manner of birds. See Nat. Hist. Pl. CXVI.

FORGA'VE. The preterit of *forgive*.

FORGE. *s.* (*forge*, French.) 1. The place where iron is beaten into form. 2. Any place where any thing is made or shaped (*Hooker*). 3. Manufacture of metalline bodies (*Bacon*).

To Forge. *v. a.* (*forger*, old French.) 1. To form by the hammer (*Chapman*). 2. To make by any means (*Locke*). 3. To counterfeit; to falsify (*Shakspeare*).

Forge properly signifies a little furnace, wherein smiths and other artificers of iron or steel, &c. heat their metals red hot, in order to soften and render them more malleable and manageable on the anvil. An ordinary forge is nothing but a pair of bellows, the nozzle of which is directed upon a smooth area, on which coals are placed. The nozzle may also be directed to the bottom of any furnace, to excite the combustion of the coals placed there, by which a kind of forge is formed. In laboratories, there is generally a small furnace consisting of a cylindrical piece, open at top, which has at its lower side a hole for receiving the nozzle of a double bellows. This kind of forge furnace is very convenient for fusions, as the operation is quickly performed, and with few coals. In its lower part, a little above the hole for receiv-

ing the nozzle of the bellows, may be placed an iron plate of the same diameter, supported upon two horizontal bars, and pierced near its circumference, with four holes diametrically opposite to each other. By this disposition the wind of the bellows, pushed forcibly under this plate, enters at these holes; and thus the heat of the fire is equally distributed, and the crucible in the furnace is equally surrounded by it. As the wind of bellows strongly and rapidly excites the action of the fire, a forge is very convenient when a great heat is required. The forge, or blast-bellows, is used to fuse salts, metals, ores, &c. It is much used also in works which require strong heat, without much management; and chiefly in the smelting of ores, and fusion of metallic matters.

Forge, in the train of artillery, is generally called a travelling forge, and may not be improperly called a portable smith's shop: at this forge all manner of smith's work is made, and it can be used upon a march, as well as in camp.

Forge is also used for a large furnace, wherein iron-ore taken out of the mine is melted down; or it is more properly applied to another kind of furnace, wherein the iron-ore, melted down and separated in a former furnace, and then cast into sows and pigs, is heated and fused over again, and beaten afterwards with large hammers, and thus rendered more soft, pure, ductile, and fit for use

FO'RGER. *s.* (from *forge.*) 1. One who makes or forms. 2. One who counterfeits any thing (*West*).

FO'RGERY. *s.* (from *forge.*) 1. The crime of falsification (*Stephens*). 2. Smith's work; the act of the forge (*Milton*).

Forgery, is where a person counterfeits the signature of another with intent to defraud, which by the law of England is made a capital felony.

A receipt to a cash memorandum is not a receipt on acquittance for the payment of money within 2 Geo. II. c. 25, against forgery.

Forgery may be committed by making a mark in the name of another person. It may also be committed in the name of a person who never had existence. And it may be committed of an instrument, though such an instrument as the one forged does not exist either in law or fact.

Indorsing a real bill of exchange with a fictitious name is forgery; although the use of a fictitious name was not essential to the negociation.

A forged bank-note (although the word pounds is omitted in the body of it), and there is no water-mark in the paper, is a counterfeit note for the payment of money.

Altering an entry of money received, made by a cashier of the bank, in the bank-book of a person keeping cash there, by prefixing a figure to increase the amount of the sum received, is forging a receipt for money.

A receipt indorsed on a bill of exchange in a fictitious name is forgery, although such name does not purport to be the name of any particular person.

If a person who has for many years been known by a name which was not his own, and afterwards assumes his real name, in that name *draws a bill of exchange, he will not be guilty* of forgery, although such bill was drawn for fraudulent purposes.

If any person shall falsely make, forge, or counterfeit, or cause or procure to be falsely made, forged, or counterfeited, or willingly aid or assist in the false making or counterfeiting, any deed, will, bond, writing obligatory, bill of exchange, promissory note for payment of money, acquittance, or receipt, either for money or goods, with intent to defraud any person; or shall utter or publish the same as true, knowing the same to be false, forged, or counterfeited, he shall be guilty of felony without benefit of clergy; but not to work corruption of blood, or disherison of heirs. 2 Geo. II. c. 25.

Forging or imitating stamps to defraud the revenue, is forgery by the several stamp acts; and the receiving of them is made single felony, punishable with seven years transportation. 12 Geo. III. c. 48.

To FORGE'T. *v. a.* preter. *forgot*, part. *forgotten* or *forgot*. (forȝytan, Saxon.) 1. To lose memory of; to let go from the remembrance (*Atterbury*). 2. Not to attend; to neglect (*Isaiah*).

FORGE'TFUL. *a.* (from *forget.*) 1. Not retaining the memory of. 2. Causing oblivion; oblivious (*Dryden*). 3. Inattentive; negligent; neglectful; careless (*Hebrews. Prior*).

FORGE'TFULNESS. *s.* (from *forgetful.*) 1. Oblivion; cessation to remember; loss of memory (*Shakspeare*). 2. Negligence; neglect; inattention (*Hooker*).

FO'RGETIVE. *a.* (from *forge.*) That may forge or produce (*Shakspeare*).

FORGE'TTER. *s.* (from *forget.*) 1. One that forgets. 2. A careless person.

FORGING, in smithery, the beating or hammering iron on the anvil, after having first made it red-hot in the forge, in order to extend it into various forms, and fashion it into works. (See Forge.) There are two ways of forging and hammering iron. One is by the force of the hand, in which there are usually several persons employed, one of them turning the iron, and hammering likewise, and the rest only hammering. The other way is by the force of a water-mill, which raises and works several huge hammers, beyond the force of man; under the strokes whereof the workmen present large lumps or pieces of iron, which are sustained at one end by the anvils, and at the other by iron chains fastened to the cieling of the forge. (See Mill.) This last way of forging is only used in the largest works, as anchors for ships, &c. which usually weigh several thousand pounds. For the lighter works, a single man serves to hold, heat, and turn with one hand, while he hammers with the other. Each purpose the work is designed for requires its proper heat; for if the iron be too

cold, it will not feel the weight of the hammer, as the smiths call it when it will not batter under the hammer; and if it be too hot it will red-sear, that is, break or crack under the hammer. The several degrees of heat the smiths give their iron are, first, a blood-red heat; secondly, a white-flame heat; and thirdly, a sparkling or welding heat.

To FORGI'VE. *v. a.* pret. *forgave*; part. pass. *forgiven.* (ꝼoɲʒıꝼan, Saxon.) 1. To pardon; not to punish (*Prior*). 2. To pardon a crime (*Isaiah*). 3. To remit; not to exact debt or penalty.

FORGI'VENESS. *s.* (ꝼoɲʒıꝼeneꝼꝼe, Sax.) 1. The act of forgiving (*Daniel.*) 2. Pardon of an offender (*Dryden*). 3. Pardon of an offence (*South*). 4. Tenderness; willingness to pardon (*Sprat*). 5 Remission of a fine, penalty, or debt.

FORGI'VER. *s.* (from *forgive.*) One who pardons.

FORGO'T. FORGO'TTEN. (part. pass. of *forget.*). Not remembered (*Prior*).

To FORHA'IL. *v. a.* To harass, tear, torment (*Spenser*).

FORISFAMILIATION, in law. When a child, upon receiving a portion from his father, or otherwise, renounces his legal title to any further share of his father's succession, he is said to be forisfamiliated.

FORK, a well known instrument, consisting of a handle and blade, divided at the end into two or more points or prongs. The pitch-fork is a large utensil of this construction, employed in hay-making, &c. The table-fork, an instrument now so indispensable, did not come into use in England till the reign of James I. as we learn from a remarkable passage in Coryat. The reader will probably smile at the solemn manner in which this important discovery or innovation is related: "Here I will mention a thing that might have been spoken of before in discourse of the first Italian towns. I observed a custom in all those Italian cities and townes through the which I passed, that is not used in any other country that I saw in my travels, neither do I thinke that any other nation of Christendome doth use it, but only Italy. The Italian and also most strangers that are commonant in Italy, doe always at their meals use a little forke when they eat their meate; for while with their knife, which they hold in one hand, they cut the meate out of the dish, they fasten the forke which they hold in the other hand upon the same dish, so that whatsoever he be, that sitting in the company of any others at meale, should unadvisedly touch the dish of meat with his fingers, from which all the table doe, he will give occasion of offence unto the company, as having transgressed the lawes of good manners, insomuch that for his error, he shall be at least brow-beaten, if not reprehended in wordes. This form of feeding I understand is generally used in all parts of Italy, their forkes for the most part being made of yronn, steele, and some of silver, but those are used only by gentlemen. The reason of this their curiosity is, because the Italian cannot by any means endure to have his dish touched with fingers, seeing all men's fingers are not alike cleane. Hereupon I myself thought good to imitate the Italian fashion by this forked cutting of meate, not only while I was in Italy, but also in Germany, and oftentimes in England since I came home: being once quipped for that frequently using my forke, by a certain learned gentleman a familiar friend of mine, Mr. Lawrence Whitaker: who in his merry humour doubted not to call me a table *Furcifer*, only for using a forke at feeding, but for no other cause."

FORK (Tuning), an instrument used by musicians to pitch the key of a tune to be sung. It is made of steel, much in the shape of a table fork, though with longer and thicker prongs; these being put into motion by striking or otherwise, yield, in consequence of their vibration, a fine, clear tone, as of the note G, A, C, from which the key note of the tune is readily taken.

FORK. (*furca.*) In botany. A divided prickle. Called bifid or trifid from the number of divisions, Exemplified in berberis, ribes, gleditsia, &c.

To FORK. *v. n.* (from the noun.) To shoot into blades, as corn does out of the ground.

FO'RKED. *a.* (from *fork.*) Opening into two or more parts (*Shakspeare*).

FORKED, furcatus: branched or sub-divided, usually into two. Applied to anthers; to bristles; as in leontodon hispidum, Arabis thaliana; to fronds, as in Jungermannia furcata; and to stems; but dichotomous is more proper, at least when they divide more than once.

FO'RKEDLY. *ad.* In a forked form.

FO'RKEDNESS. *s.* (from *forked.*) The quality of opening into two parts or more.

FO'RKHEAD. *s.* (*fork* and *head.*) Point of an arrow (*Spenser*).

FO'RKY. *a.* (from *fork.*) Forked; furcated; opening into two parts (*Pope*).

FORLANA, a kind of dance much used in Venice.

FORLI, an ancient town of Romagno, capital of a territory of the same name, with a bishop's see. Lat. 44. 16 N. Lon. 11. 44 E.

FORLO'RE. *a.* Deserted; forsaken (*Fairfax*).

FORLO'RN. *a.* (ꝼoɲloɲen, Saxon.) 1. Deserted; destitute; forsaken; wretched; helpless; solitary (*Knolles. Fenton*). 2. Taken away (*Spenser*). 3. Small; despicable (*Shakspeare*).

FORLO'RN. *s.* 1. A lost, solitary, forsaken man (*Shakspeare*). 2. FORLORN *Hope.* The soldiers who are sent first to attack, and are therefore doomed to perish (*Dryden*).

FORLO'RNNESS. *s.* Destitution; misery; solitude (*Boyle*).

To FORLI'E. *v. n.* (from *fore* and *lie.*) To lie before (*Spenser*).

FORM. *s.* (*forma*, Latin.) 1. The external appearance of any thing; representation; shape (*Grew*). 2. Being, as modified by a particular shape (*Dryden*). 3. Particular

model or modification (*Addison*). 4. Beauty; elegance of appearance (*Isaiah*). 5. Regularity; method; order (*Shakspeare*). 6. External appearance without the essential qualities; empty show (*Swift*). 7. Ceremony; external rites (*Clarendon*). 8. Stated method; established practice; ritual and prescribed mode (*Hooker*). 9. A long seat (*Watts*). 10. A class; a rank of students (*Dryden*). 11. The seat or bed of a hare (*Prior*). 12. The essential, specifical, or distinguishing modification of matter, so as to give it a peculiar manner of existence (*Harris*). See also on the word FORM our article DICTIONARY.

FORM, in the sportsman's dialect, is the spot in which the hare takes her seat at the dawn of day, to secrete herself, after having followed her various exercise all night (or rather in the early part of the morning) to avoid discovery. When found sitting, she is said to be in her form. If shot as she sits, without being previously disturbed, she is then said to have been shot in her form. Hares vary their places of sitting according to the season, the sun, and the wind. Soon after harvest they are found in wheat, barley, and oat stubbles, as well as in rushy grass moors: when these become bare, they retire to coverts, banks, hedges, and hedge-rows. After Christmas, and in the spring months, dry fallows, particularly those lying towards the sun with an ascent, are seldom without hares, if there be any in the district.

FORM (Printer's), an assemblage of letters, words and lines, ranged in order, and so disposed into pages by the compositor; from which, by means of ink and a press, the printed sheets are drawn. Every form is inclosed in an iron chase, wherein it is firmly locked by a number of pieces of wood; some long and narrow, and others of the shape of wedges. There are two forms required for every sheet, one for each side; and each form consists of more or fewer pages, according to the size of the book. See PRINTING.

FORM OF A SERIES, in algebra, that affection of an undeterminate series, which arises from the different values of the indices of the unknown quantity.

To FORM. *v. a.* (*formo*, Latin.) 1. To make out of materials (*Pope*). 2. To model to a particular shape (*Milton*). 3. To modify; to scheme; to plan (*Dryden*). 4. To arrange; to combine in a particular manner: as, he *formed* his troops. 5. To adjust; to settle (*Decay of Piety*). 6. To contrive; to coin (*Rowe*). 7. To model by education or institution (*Dryden*).

FORMA PAUPERIS, in law, is when a person has just cause of suit, but is so poor that he cannot defray the usual charges of suing at law or in equity; in which case, on making oath that he is not worth 5*l*. in the world, on all his debts being paid, and producing a certificate from some lawyer that he has good cause of suit, the judge will admit him to sue in forma pauperis; that is, without paying any fee to counsellors, attorneys, or clerks: the statute 11 Hen. VII. c. 12. having enacted, that counsel and attorneys, &c. shall be assigned to such poor persons gratis. Where it appears that any pauper has sold or contracted for the benefit of his suit whilst it is depending in court, such cause shall be thenceforth totally dismissed; and a person suing in forma pauperis shall not have a new trial granted him, but is to aquiesce in the judgment of the court.

FO'RMAL. *a.* (*formel*, Fr. *formalis*, Lat.) 1. Ceremonious; solemn; precise; exact to affectation (*Ba.*). 2. Done according to established rules and methods; not sudden (*Hooker*). 3. Regular; methodical (*Waller*). 4. External; having the appearance but not the essence (*Dryden*). 5. Depending upon establishment or custom (*Pope*). 6. Having the power of making any thing what it is; constituent; essential (*Holder*). 7. Retaining its proper and essential characteristic; regular; proper (*Shakspeare*).

FO'RMALIST. *s.* (*formaliste*, French.) One who practises external ceremony; one who prefers appearance to reality (*South*).

FORMA'LITY. *s.* (*formalité*, French.) 1. Ceremony; established mode of behaviour. 2. Solemn order, mode, habit, or dress (*Swift*). 3. External appearance (*Glanville*). 4. Essence; the quality by which any thing is what it is (*Stillingfleet*).

To FO'RMALIZE. *v. a.* (*formalizer*, Fr.) 1. To model; to modify (*Hooker*). 2. To affect formality.

FO'RMALLY. *ad.* (from *formal.*) 1. According to established rules (*Shakspeare*). 2. Ceremoniously; stiffly; precisely (*Collier*). 3. In open appearance (*Hooker*). 4. Essentially; characteristically (*Smalridge*).

FORMA'TION. *s.* (*formation*, French.) 1. The act of forming or generating (*Watts*). 2. The manner in which a thing is formed.

FO'RMATIVE. *a.* (from *formo*, Latin.) Having the power of giving form; plastic (*Bentley*).

FORME, in the manage, a French term for a swelling in the very substance of a horse's pastern, and not in the skin. Solleysel says, this complaint occurs as well in the hind legs as in the fore; "and though it be an imperfection not very common, yet it is dangerous, in that it will admit of no other remedy but firing, and taking out the sole; neither can the fire be given to that part without great difficulty and hazard. In the beginning the forme does not exceed half the bigness of a pigeon's egg, but labour and exercise will make it, in time, to grow to about half the bigness of a hen's egg; and the nearer it is situated to the coronet upon the quarters, so much the more dangerous it is." This seems to be nothing more than the disease called a quittor.

FORMEDON, in law, (breve *de forma donationis*) a writ that lies for a person who has a right to lands or tenements, by virtue of an entail, arising from the statute of Westminster. 2. Ch. II.

FO'RMER. *s.* (from *form.*) He that forms; maker; contriver; planner (*Ray*).

FO'RMER. *a.* (from ƿoꞃma, Saxon, first.) 1. Before another in time (*Shakspeare*). 2. Mentioned before another (*Pope*). 3. Past: as, *this was the custom in* former *times.*

FO'RMERLY. *ad.* In times past (*Add.*).

FORMIAT. See FORMIC ACID.

FORMIC ACID. Acid of ants. There can be no doubt that the strong acid smell which is observed to arise from the atmosphere of an ant-bed, after being disturbed, must have been known to the ancients, but from their want of chemical knowledge, it is not very extraordinary that they should have been ignorant that this smell proceeded from an acid of a peculiar kind. In more modern times, the existence of this acid was first made known by Mr. Ray, in a correspondence with Dr. Hulse. The doctor informed him that these insects, when irritated, give out a clear liquid, which tinges blue flowers red; a fact which had been observed by others. Hence it was found to be an acid, which was obtained by bruising the insects, by distilling them, and by infusing them in water. The French chemists obtained the acid by bruising ants, and macerating them in alcohol. When the alcohol was distilled over, an acid liquor remained, which saturated with lime, mixed with sulphuric acid, and distilled, yielded a liquid that possessed all the properties of acetic acid. This acid has been thought by some chemists, and especially by Margraaf, to be acetic acid, or at least to have a great analogy to vinegar; and by others to be a mixture of acetic and malic acid. A minute examination of it, however, sufficiently proves, that it differs very essentially from both, whether separate or in conjunction, quite as much, indeed, as these differ from each other; it differs in its specific gravity, in its effects with alkalies, in its metallic salts, and in its affinities.

Thouvenel, on the contrary, contended, that it is very closely related to the phosphoric, or, as he calls it, the microcosmic; but he has not stated in what the relation or analogy consists. Lister affirmed that he had extracted a similar acid from wasps and bees; but Arvidson and Oehrn failed in making the attempt after him, nor has any one been able to succeed since.

The formic acid, therefore, is an acid *sui generis:* it is extracted from ants, either by distillation or expression with water; in the living insect it reddens blue flowers; flies off in the form of a vapour smelling like musk: destroys animals under this gasseous form; is capable of serving economical purposes like vinegar; is decomposed by a great heat; takes oxygen from oxygenated muriatic acid; and forms salts with alkalies and earths, which are crystallizable and not deliquescent.

These salts are called formiats.

FORMICA. Ant or emmet. In zoology, a genus of the class insecta, order hymenoptera. Feelers four, unequal with cylindrical articulations placed at the tip of the lip which is cylindrical, and nearly membranaceous; antennas filiform; a small erect scale between the thorax and abdomen; females and neuters (or rather those commonly called *neuters*) armed with a concealed sting; males and females with wings; neuters wingless. This is a gregarious and proverbially industrious family, consisting, like bees, of males, females, and a third kind which are yet called neuters. These last are the well-known little insects who construct the nests or ant-hills, who labour with such unremitting assiduity for the support of themselves and the idle males and females, and who guard with such ferocity the larves, or what are commonly called ants eggs. They wander about all day in search of food or materials for the nest; and assist each other in bringing home what is too cumbersome for such as have attempted it. They every day bring out of the nest and expose to the warmth of the sun the newly hatched larvæ, and feed them till they are able to provide for themselves. In the evening they consume together whatever has been collected during the day, and do not, as is commonly supposed, lay up any store for the winter, but probably against that season become torpid or die. They are peculiarly fond of plant-lice, and are themselves eagerly sought after by the ant-eater and various birds. A very grateful acid is procured from them by maceration and distillation. See FORMIC ACID: as also Nat. Hist, Plate CXVI.

1. F. cœspitum. This is the common ant or emmet: black in colour, petiole of the abdomen with two tubercles: scutel two-toothed. Inhabits Europe in dry meadows under moss. The males and females fly abroad in large swarms in a serene day, like the day fly.

2. F. herculanea. Herculanean ant. So called from being the largest species of the genus: in colour black; abdomen ovate; legs ferruginous. Found chiefly in dry woods of pine or fir, where it inhabits a large conical nest or hillock, composed of dry vegetable fragments, chiefly of fir-leaves; the nest is internally divided into distinct roads or avenues converging towards the centre, and opening externally: in the centre are placed the young larvæ under the care of the neutrals. Found in our own country, and in Europe in general.

3. F. omnivora. Thorax rough, with raised dots; petiole with two tubercles; body testaceous; abdomen very minute. Inhabits Surinam; and in such swarms that a sheep killed and left abroad in the evening will be found entirely devoured by the morning.

FORMICATION, in building, arched vaulting.

FO'RMIDABLE. *a.* (*formidabilis*, Lat.) Terrible; dreadful; tremendous; terrific.

FO'RMIDABLENESS. *s.* (from *formidable,*) 1. The quality of exciting terror or dread. 2. The thing causing dread (*D. of P.*).

FO'RMIDABLY. *ad.* (from *formidable.*) In a terrible manner (*Dryden*).

FO'RMLESS. *a.* (from *form.*) Shapeless; wanting regularity of form (*Shakspeare*).

FORMOSA, a large island in the Eastern ocean, between 119° and 122° E. lon. and 22° and 25° N. lat. about 100 miles E. of Canton

in China. It is subject to the Chinese, who, notwithstanding its proximity, did not know of its existence till the year 1430. It is about 255 miles long and 75 broad. A long chain of mountains, running from N. to S. divides it into two parts, the E. and W. The Dutch built the fort of Zealand in the W. part in 1634. This secured to them the principal port of the island. They were driven thence in 1661 by a Chinese pirate, who had made himself master of all the W. part. But in 1682 the whole island submitted to the emperor of China. It contains extensive and fertile plains, watered by a great number of rivulets that fall from the mountains. Its air is pure and wholesome; and the earth produces abundance of corn, rice, &c.

FORMULA, or FORMULARY, a rule or model, or certain terms prescribed or decreed by authority, for the form and manner of an act, instrument, proceeding, or the like.

FORMULA, in church history and theology, signifies a profession of faith.

FORMULA, in medicine, a little form of prescription, such as physicians direct in extemporaneous practice, in distinction from the greater forms in pharmacopœias, &c.

FORMULA, in mathematics, a theorem or general rule or expression for resolving certain particular cases of some problem, &c. So $\frac{s}{2}+\frac{d}{2}$ is a general formula for the greater of two quantities whose sum is s and difference d; and $\frac{s}{2}-\frac{d}{2}$ is the formula, or general value for the less quantity. Again $\sqrt{dx-x^2}$ is the formula or general value of the ordinate of a circle whose diameter is d and absciss x.

FORNAX, a goddess at Rome, who presided over the baking of bread. Her festivals, called Fornicalia, were first instituted by Numa. (*Ovid*).

FORNAX CHEMICA, in astronomy, the chemist's furnace, a new southern constellation, consisting of 14 stars of the first six magnitudes, i. e. 0. 0. 0. 1. 2. 11.

FORNICATE. (*fornix*, an arch or vault.) In botany, ARCHED or VAULTED, which see.

To FO'RNICATE. *v. a.* (from *fornix*, Lat.) To commit lewdness (*Brown*).

FORNICA'TION. *s.* (*fornication*, Fr.) 1. Concubinage, or commerce with an unmarried woman (*Graunt*). 2. In scripture, sometimes idolatry (*Ezekiel*).

FORNICA'TOR. *s.* (*fornicateur*, French.) One that has commerce with unmarried women.

FORNICA'TRESS. *s.* A woman who without marriage cohabits with a man (*Shaks.*).

FORNIX. (*fornix*, an arch or vault. A part of the corpus callosum in the brain is so called, because, if viewed in a particular direction, it has some resemblance to the arch of an ancient vault.) The medullary body, composed of two anterior and two posterior crura, situated at the bottom and inside of the lateral ventricle, over the third ventricle, and below the septum lucidum.

FORRAGE, among military men, denotes hay, oats, barley, wheat, grass, clover, &c. brought into the camp by the troopers, for the sustenance of their horses.

FORRES, a town of Murrayshire, seated on an eminence, 2 miles E. of the river Findhorn. Here are manufactures of linen and sewing thread; and east from the town is a remarkable obelisk 23 feet high, said to be the most stately monument of the Gothic kind to be seen in Europe.

To FORSA'KE. *v. a.* preter. *forsook*; part. pass. *forsook* or *forsaken*. (*versarken*, Dutch.) 1. To leave in resentment or dislike (*Cowley*) 2. To leave; to go away from (*Dryden*). 3. To desert; to fail (*Rowe*).

FORSA'KER. *s.* (from *forsake*.) Deserter; one that forsakes (*Apocrypha*).

FORSKOLEA, in botany, a genus of the class octandria, order tetragynia. Calyx four or five-leaved, longer than the corol; petals eight or ten, spatulate; pericarpless; seeds four or five, connected by wool. Three species; Egypt, Teneriffe, and the Cape.

FORSO'OTH. *ad.* (ꝼoꞃꞅoðe, Saxon.) In truth; certainly; very well (*Hayward*).

FORSTER (John Reinhold, LL.D.) professor of natural history in the university of Halle, member of the academy of science at Berlin, and of other learned societies, was born at Dirschau, in West Prussia, in the month of October, 1729, and was formerly a Protestant clergyman at Dantzick. He had a numerous family, and the emoluments of his office were slender. He therefore quitted Dantzick, and went, first to Russia, and thence to England, in quest of a better settlement than his own country afforded. In the Socinian academy at Warrington, he was appointed tutor in the modern languages, with the occasional office of lecturing in various branches of natural history. For the first of these he was by no means well qualified; his extraordinary knowledge of languages, ancient and modern, being unaccompanied by a particle of taste. As a natural historian, a critic, geographer, and antiquary, he ranked much higher. But these were acquisitions of comparatively little use to him in that situation.

At length he obtained the appointment of naturalist and philosopher (if the word may be so used) to the second voyage of discovery undertaken by captain Cook; and from 1772 to 1775 he accompanied that immortal navigator round the world. On his return he resided in London, till the improper conduct of himself and his son made it expedient for them both to leave the kingdom. Fortunately he received an invitation to Halle, where, for 18 years, he was a member of the philosophical and medical faculties. Among his works are: An Introduction to Mineralogy, or, An accurate Classification of Fossils and Minerals, &c London, 1768, 8vo. A Catalogue of the Animals of North America, with short Directions for collecting, preserving, and transporting all

Kinds of Natural Curiosities, London, 1771, 8vo. Observations made during a Voyage round the World, on Physical Geography, &c. London, 1778. He was the author of a great many productions in English, Latin, or German, and of several papers in the Philosophical Transactions. He translated into English, Bourgainville's Voyage round the World, and Kalm's, Bossu's, and Reidsel's Travels. He was employed likewise, when in England, in the Critical Review; and he wrote various detached papers on different subjects, which have been inserted in foreign journals and the transactions of learned academies. He died at Halle on the 16th of December 1798, in the 70th year of his age.

FORSTERA, in botany, a genus of the class gynandria, order diandria. Calyx double; the outer inferior, three-leaved; inner, superior, six-cleft; corol tubular; berry inferior, one-celled, one-seeded. One species: an ascending herbaceous plant of New Zealand, having white flowers with a red throat.

To FORSWE'AR. *v. a.* pret. *forswore*; part. *forsworn.* (forrpæman, Saxon.) 1. To renounce upon oath (*Shakspeare*). 2. To deny upon oath (*Shakspeare*). 3. With the reciprocal pronoun: as, *to forswear himself*; to be perjured; to swear falsely (*Smith*).

To FORSWE'AR. *v. n.* To swear falsely; to commit perjury (*Shakspeare*)

FORSWE'ARER. *s.* (from *forswear.*) One who is perjured.

FORT, in the military art, a small fortified place, environed on all sides with a moat, rampart, and parapet. Its use is to secure some high ground, or the passage of a river, to make good an advantageous post, to defend the lines and quarters of a siege, &c. Forts are made of different figures and extents, according as the ground requires. Some are fortified with bastions, others with demi-bastions. Some again are in form of a square, others of a pentagon. A fort differs from a citadel, as this last is built to command some town.

FORTS (Vitrified), a very singular kind of structure found in the Highlands and northern parts of Scotland, in which the walls have the appearance of being melted into a solid mass, so as to resemble the lava of a volcano, for which indeed they have been taken by several persons who have visited them.

These walls were taken notice of by Mr. Williams, an engineer, who wrote a treatise upon the subject, and was the first who supposed them to be the works of art; other naturalists having attributed them to a volcanic origin. These works are commonly situated on the tops of small hills, commanding an extensive view of the adjacent valley or low country. The area on the summit, varying, as is supposed, according to the number of cattle the proprietor had to protect, or the dependents he was obliged to accommodate, is surrounded with a high and strong wall, of which the stones are melted, most of them entirely; while others, in which the fusion has not been so complete, are sunk in the vitrified matter in such a manner as to be quite inclosed with it; and in some places the fusion has been so perfect, that the ruins appear like masses of coarse glass.

In the Phil. Trans. of the Royal Society of London for 1777, Part II. No. 20. is an account of Creck Faterick, there termed a volcanic hill near Inverness, in a letter from Thomas West, esq. to Mr. Law, F.R.S. in which the writer does not hesitate to pronounce this hill an extinguished volcano: and having sent specimens of the burnt matter for the inspection of the Royal Society, the secretary subjoins a note to the paper, intimating that these specimens, having been examined by some of the members well acquainted with volcanic productions, were by them judged to be real lava. Such was likewise the opinion of the late Andrew Crosbie, esq. who, in an account which he gave to the Philosophical Society of Edinburgh in 1780, offered some very curious conjectures with regard to that process of nature, by which he supposed the whole of this hill to have been thrown up from the bottom of the sea by the operation of intestine fire.

Mr. Tytler agrees with those who think the vitrified structures to be artificial works; but he differs from Mr. Williams and others, who think that they were vitrified on purpose for cementing the materials together. His reason for this is, that the number of forts that show marks of vitrification is inconsiderable when compared with those that do not. He therefore considers the vitrification as accidental, and describes the manner in which he conceives it must have been accomplished. Among other observations of his opinion, he urges, that, in the fortification on Craig Phadrick, a large portion of the outward rampart bears no marks of vitrification. Mr. Cordiner, on the other hand, is of opinion, that the vitrifications in question cannot have been the works of art, and ridicules the contrary hypothesis, though without adducing any argument against it.

Mr. Tytler concludes his dissertation with a conjecture, which indeed seems well supported, that the forts in question were constructed, not only before the Roman invasion, but before the introduction of the rites of the Druids into Britain; as "there appears no probability that the inhabitants either lived under such a government as we know to have prevailed under the influence of the Druids, or had any acquaintance with those arts which it is certain they cultivated." On a view of the disputes which have agitated the learned on this obscure subject, we can only observe, that their arguments seem to have placed it in a state of equiponderance, and that the fact remains open to the investigation of future speculators.

FORTE, a musical term, directing the performer to sing or play loudly: its superlative is F. F. or fortissima.

FO'RTED. *a.* (from *fort.*) Furnished or guarded by forts: out of use (*Shakspeare*).

FORTMENT, a musical term, implying strength and energy.

FORTESCUE (Sir John), an English

judge. He was born in the parish of Wear Gifford, in Devonshire, and educated at Oxford, from whence he removed to Lincoln's-inn. In 1430 he was made a sergeant at law, and in 1441 chief justice of the court of King's-bench. He served Henry VI. with such fidelity, that in the first parliament of Edward IV. he was attainted of high treason with other adherents of that unfortunate prince, whom he followed into Scotland, where Henry made him chancellor of England. In 1463 he went abroad, and settled in Lorrain. While in exile, he wrote his famous book, entitled, De Laudibus Legum Angliæ, which however was not published till the reign of Henry VIII.; since which it has been frequently printed. When the affairs of the house of Lancaster turned, Fortescue came back to England, and though his party did not succeed, yet he remained unmolested. He lived to the age of 90, and was buried in the church of Elberton in Gloucestershire, where he had bought an estate. The best edition of his book is that of 1741.

FORTEVENTURA, one of the Canary Islands, 65 miles in length, and of a very irregular breadth. It produces plenty of wheat, barley, beeves, and goats. Lat. 28. 4 N. Lon. 14. 26 W.

FORTH. *ad.* (ꝼoɲð, Saxon; whence *further, furthest,* corrupted from *forther, forthest.*) 1. Forward; onward in time (*Spenser*). 2. Forward in place or order (*Whitgift*). 3. Abroad; out of doors (*Shakspeare*). 4. Out away; beyond the boundary of any place (*Spenser*). 5. Out into public view (*Waller*). 6. Thoroughly; from beginning to end (*Shakspeare*). 7. To a certain degree (*Hammond*). 8. On to the end (*Memoir in Strype*).

Forth. *prep.* Out of (*Donne*).

Forth, a fine river of Scotland, which rises in Perthshire. After a course of nearly 40 miles it meets the German ocean a little below Alloa, where it forms a noble æstuary, called the Frith of Forth.

FORTHCO'MING. *a.* (*forth* and *coming.*) Ready to appear; not absconding (*Shakspeare*).

FORTHI'SSUING. *a.* Coming out; coming forward from a covert (*Pope*).

FORTHRI'GHT. *ad.* Straight forward; without flexions (*Dryden*).

Forthri'ght. *s.* A straight path (*Shakspeare*).

FORTHWI'TH. *ad.* Immediately; without delay; at once; straight (*Davies*).

FO'RTIETH. *a.* (from *forty.*) The fourth tenth.

FO'RTIFIABLE. *a.* (from *fortify.*) What may be fortified.

FORTIFICA'TION. *s.* (*fortification*, Fr.) 1. The science of military architecture. 2. A place built for strength (*Sidney*). 3. Addition of strength (*Gov. of Tongue*).

Fortification, called also Military Architecture, is the art of strengthening a place by erecting batteries, walls, and other works, around the same, to render it capable of being defended by a small force against the attack of a more numerous enemy.

At a time when the great simplicity of manners gave a limit to the ambition even of the most aspiring, and when science was yet in the womb of time, we may reasonably conclude, that the means of control and of resistance, then in use, were neither costly, laborious, nor very effectual. The details furnished in scripture prove incontestibly, that even the circumvallations used at their date were inadequate to the purposes of security and duration. In fact, the events that shone conspicuous in those times were, with very few exceptions, pitched battles in the open plain, ambuscades, and treasonable conspiracies!

Nor do we find in the more recent histories of Rome, of Greece, of Asia, or of other parts then holding any rank in the military world, much to support the opinion of the ancients having knowledge of fortification. The few places that made any resistance appear to have been principally maintained by the personal prowess of their defenders. Their walls were, indeed, sometimes of great moment, as we see in the instance of Troy; which, if existing in the eighteenth century, would probably capitulate at the first summons.

It was not to be expected that where the powers of demolition were insignificant, the means of resistance would be extended beyond the quantum absolutely necessary. The catapultæ, the battering ram, the tower, and such devices, were opposed by heavy masses of stone, or of other adequate materials, on which the besieged mounted to repel the assault. The various contrivances whereby those machines received additional vigour, and the necessity that arose for opposing to their progress more resistance than could be accumulated immediately in their front, (of the tower in particular) first gave rise to the introduction of projections from the even line of the wall, whereby the besiegers could be annoyed laterally, as well as immediately front to front.

Still the engineer confined himself to small projections, generally semicircular, which, for the most part, appear to have been added to the old walls, impending like our modern balcony windows. In the sequel, these towers were built the same as the other parts of circumvallation, and, like the modern bastion, rested on the terra firma. It however seems doubtful, whether the former mode was not the best, considering every circumstance attendant upon the ancient mode of assault, and the nature of their weapons.

The invention of gunpowder does not appear to have made any important change for several years, nor indeed until heavy artillery formed a part of the assailants' means, as may be proved by an examination of the remaining castles, towers, keeps, &c. the dates may be traced beyond the middle of the fourteenth century. Such were the solidity and the hardness of many ancient buildings, that the stone shots, originally used, produced a very slight effect; nor was it until iron balls were brought into use that the powers of cannon were, in any measure, ascertained.

That point being gained, the whole system of defence was necessarily made to conform to the destructive engines which now were added to the common practices of assault. The sword, buckler, lance, dart, javelin, sling, bow and arrow, lost their wonted estimation, and, dwindling into insignificance on the great scale, were reserved for individual contest, or for the lesser purposes of desultory warfare. The great object was to construct such stupendous bulwarks as might not only oppose the newly devised missiles, but, at the

same time, support similar means of destroying the invading army.

Hence arose the formation of ramparts, and, gradually, the necessity for deep ditches, and various outworks, whereby considerable delay and difficulty might be created.

The fortifications of the fifteenth century, although to a certain extent new modelled, and made conformable to the necessity imposed by the invention and use of cannon, nevertheless did not display any ingenuity in regard to mutual defence. That great principle was little understood, and the minutiæ of the science remained, for a long time, miserably defective. Men of genius, at length, in part remedied the errors of the old school, and opened the way for that exactness of proportion, and for that systematic arrangement, which characterize the works of modern times. The impregnable fortresses to be seen in various parts of Europe, cannot fail to transmit the names of their several engineers to posterity; unhappily, not unaccompanied by those of the traitors who, even since the commencement of the present century, have shamefully abandoned the posts of honour, and yielded to inferior powers.

The immense armies now constantly brought into the field, and the heavy trains of artillery by which they are, in almost all cases, attended, occasion not only an adequate preparation for resistance, but the necessity for establishing lines of communication, of depots, &c. all of which must be on the best construction for defence, containing safe lodgment for a sufficient garrison, together with ample and secure magazines for provisions and for stores. Hence the province of the engineer becomes peculiarly important; it comprises various branches of information, and requires that readiness of computation, of discernment, and of appropriate resource, which rarely combine in the same individual. The merely planning in the closet, and the laying down on the soil such defences as may perhaps be void of fault, so far as relates to mutual support, and to the great work of procrastination, will avail nothing, if the other essentials are neglected; and even when they are not, the whole may be rendered abortive, and become contemptible, merely from a want of judgment in point of locality.

Those whose turn of mind, or whose professional pursuits, lead them to trace the gradual progress of fortification minutely from its rude origin to its present state, will read with pleasure the history given by Mr. Robins in the preface to his Gunnery. The principal treatises on fortification are Melder's Praxis Fortificatoria: Les Fortifications du Comte de Pagan: L'Ingénieur Parfait du Sieur de Ville: Sturmy's Architectura Militaris Hypothetical.: Blondel's Nouvelle Maniere de Fortifier les Places: the Abbé de Fay's Veritable Maniere de Bien Fortifier: Vauban's Ingénieur François: Coehorn's Nouvelle Fortification tant pour un Terrain bas et humide, que sec et elevé: Alexander de Grotte's Fortification: Donatus Roselli's Fortification: Medrano's Ingénieur François: the chevalier de St. Julien's Architecture Militaire: Lansberg's Nouvelle Maniere de Fortifier les Places: an anonymous treatise in French, called Nouvelle Maniere de Fortifier les Places, tirée des Methodes du chevalier de Ville, &c.: Ozanam's Traité de Fortification: Memoires de l'Artillerie de Surirey de St. Remy: Muller's treatises of Elementary and Practical Fortification: Montalambert's Fortification Perpendiculaire: Landmann's works on Fortification: Pleydell's Fortification: and Loches's Field Fortification.

From the general idea and office of fortification some useful fundamental rules or maxims may be drawn: as,

1. That the manner of fortifying should be accommodated to that of attacking; so that no one manner can be assured always to hold, unless it be assured the manner of besieging be incapable of being altered; and that to judge of the perfection of a fortification, the method of besieging at the time when it was built must be considered.

2. All the parts of a fortification should be able to resist the most forcible machines used in besieging, and they should be equally strong on all sides.

3. A fortification should be so contrived, as that it may be defended with as few men as possible; which consideration, when well attended to, saves a vast deal of expence.

4. That the defendants may be in the better condition, they must not be exposed to the enemy's guns and mortars; but the aggressors must be exposed to theirs.

Hence, 5. All the parts of a fortification should be so disposed, as that they may defend each other: in order to this, every part there is to be flanked, i. e. capable of being seen and defended from some other; so that there be no place where an enemy can lodge himself, either unseen, or under shelter.

6. All the campaign around must lie open to the defendants; so that no hills or eminence must be allowed, behind which the enemy might shelter himself from the guns of the fortification; or from which he might annoy them with his own.

The fortress, then, is to command all the place round about; consequently the out-works must all be lower than the body of the place.

7. No line of defence is to be above point-blank musquet-shot, which is from one hundred and twenty to one hundred and fifty fathom.

8. The acuter the angle at the center, the stronger is the place; as consisting of the more sides, and consequently more defensible.

9. All the defences should be as nearly direct as possible. Such are the general laws and views of fortification: the particular ones, respecting each several work or member thereof, will be delivered under their proper articles. See BASTION.

The art of Fortification may be distinguished into two parts, viz. the *elementary* or *theoretical*, and *practical.*

Elementary or *theoretical Fortification*, consists in tracing the plans and profiles of a fortification on paper, with scales and compasses; and in examining the systems proposed by different authors, in order to discover their advantages and disadvantages.

Practical Fortification, consists in forming a project of a fortification according to the nature of the ground, and other necessary circumstances, tracing it on the ground, and executing the project, together with all the military buildings, such as magazines, store-houses, bridges, &c.

Fortification again is either offensive or defensive.

Offensive fortification is the same with the attack of a place, and is the art of making and conducting all the different works in a siege, in order to gain possession of the place.

Defensive, or *defence Fortification*, is the art of defending a town that is besieged, with all the advantages which the fortification of it will admit.

Fortification is also used for the place fortified;

or the several works raised to defend and flank it, and keep off the enemy.

All fortifications consist of lines and angles, which have various names, according to their various offices.

The principal angles are those of the center, the flanking angle, flanked angle, angle of the epaule, &c.

The principal lines are those of circumvallation, of contravallation, of the capital, &c. See each in its place.

Fortifications are divided into regular, and irregular, and again into durable and temporary.

Regular Fortification is that wherein the bastions are all equal; or that which is built in a regular polygon, the sides and angles whereof are generally about a musquet shot from each other.

In a regular fortification, the parts being all equal, have the advantage of being equally defensible; so that there are no weak places. See Pl. 72. fig. 2.

Irregular Fortification, is that wherein the bastions are unequal, and unlike; or the sides and angles not all equal, and equidistant.

In an irregular fortification, the defence and strength being unequal, there is a necessity for reducing the irregular figure, as near as may be, to a regular one; i. e. instead of inscribing it in a circle, it should be inscribed in an oval, so that one half may be similar and equal to the other half.

And as the irregularity of a figure depends on the quantity of angles and sides; the irregularity of a fortification arises either from the angles being too small, or the sides being too long, or too short.

Consequently an irregular figure being proposed to be fortified; all the angles, with the quantity of the sides, must be found, to be able to judge how it is to be fortified. See Pl. 72. fig. 1. which represents a fortification inscribed in an oval.

In this case the sides CD, GH, on the flat parts, are stronger than the sides AB, EF, on the narrow parts, supposing all the exterior sides equal, and the place equally fortified. When the angles BCD, CDE of the polygon are very great, and the besieger comes within a small distance of the works, he cannot approach nearer, without being seen in front, except by a direct sap, with traverses; and as this way of approaching presents but a small front, the besieged, who have a much larger, may oppose with peculiar advantage: whereas, if the angles HAB, ABC of the polygon, are very small, the besiegers may carry their approaches to the counterscarp itself, and have always a larger front than the besieged; and, as the besiegers must extend their approaches to three fronts, whether they are small or large, the work of the approaches before the front BCDE will be to the work before the front HABC, as the line BE is to the line HC, nearly, i. e. as the greater axis of the oval is to the less; and therefore the front CD, on the flat side, is stronger than the front AB, on the narrow side; consequently, the longer CD is, so that the lines of defence are within the reach of musket-shot, and the angles BCD, CDE, are the same, the stronger will the front be; since the works become more spacious, hold more troops to defend them, and the besiegers are obliged to extend their trenches farther. Moreover, the greater the angles of the polygon BCD, CDE are, the exterior sides being the same, the stronger will be the front CD; because the length of the line BE increases, and the extent of the besiegers approaches in proportion; and, therefore, *the strength of a fortification increases in proportion to the number and length of its sides;* so that a dodecagon is stronger than an octagon, when the length of their sides is the same. However, as it is found difficult to inscribe a polygon in an ellipse or oval, the following more easy method will answer the purpose. Reduce the spot of ground to be fortified to the figure ACEG fig. 3. and draw BE, AF, parallel to each other; draw CH, DG, perpendicular to these lines, and at equal distance from the points B and E, and let their interval be equal to that of the lines BE and AF; then, draw DC, GH, parallel to AF and BE, and equally distant from them; and from their intersections C, D, G, H, with DG, CH, as centers, describe arcs, with a radius equal to CD or GH, so as to intersect the lines AF, BE, in A, B, E, F; join the points A, B, E, F, and ABCDEFGH, will be an oblong octagon, having one half similar and equal to the other half. If a hexagon be to be described, instead of drawing the two lines CH, DG, one will be sufficient; in a decagon there must be three, and four in a dodecagon. If the sides cannot easily be made equal, then the sides AB, EF, on the narrowest part of the polygon, should be the longest, because it is the weakest. But when the figure cannot in any respect be made regular, the strength of each side must be estimated according to the works a besieger is obliged to make in the attack, and according to the obstacles he meets with in his approaches.

Marine Fortification, is sometimes used by way of distinction from land fortification, and denotes the art of raising works fit for the defence of a harbour against the attacks of any kind of shipping; but the works proper for this purpose depend in a great measure on the principles employed in the fortification of towns. However, attention should be given to the situation of roads or harbours in contriving works for their defence: e. gr. when a town lies open to the sea, on a curved, or straight bold shore, and has before it a sufficient depth of water and good anchorage, the ships, in this situation, may be well defended by forts built near the water's edge on each side of the anchoring place, so contrived as to have two or three batteries, one higher than the other, and furnished with a sufficient number of cannon, carrying shot from twenty-four to forty-eight pounds. A town, in this situation, may be defended by a rampart, or wall, well flanked, built along the shore, beside the fortifications on the land side. The works along the shore should be carried so near to the water's edge, that troops, attempting to land under the cannon of a fleet, might not find ground on which to intrench themselves. Farther, when a harbour, being a bay, has a shoal or small island lying before its entrance, a strong fort should be built upon the island, in a place where it can command the entrance on both sides, if the island be not too large; otherwise two or more forts should be erected in such places as may command the avenues to the bay; other forts should also be raised on the most convenient points of land, forming the mouth of the bay. Again, when the harbour is in a bay, whose points, forming the entrance, stretch into the sea, and approach one another within cannon shot; such a harbour may be fortified by building on both sides of its entrance one or more forts; and, if possible, a fort should also be built within the harbour's mouth in such a manner, that its cannon can rake the shipping fore and aft as they come in.

When a harbour is formed by a cluster of islands, *it is easily fortified, if the channel between* the islands is not too wide for the cannon from one or both shores; but if it be too wide, the shipping that rides there must be defended from the batteries on the shore. When the harbour lies in an inlet, or river, some miles above its mouth, a fort built at each point of the entrance, when the passage lies strait, and can be commanded from side to side, and two others between them and the harbour, but not directly opposite, unless the breadth of the channel requires it, will be a proper security for the shipping in such a harbour; and if the channel or river is winding, the forts should be built where they can command a reach at least, or be so placed at the bends, as to command two adjacent reaches. See Robertson's Treat. of Marine Fort. part ii.

Durable Fortification, is that built with design to remain a standing shelter for ages. Such are the usual fortifications of cities, frontier places, &c.

Temporary Fortification, is that erected on some emergent occasion, and only for a little time.

Such are field-works, cast up for the seizing and maintaining a post, or passage; those about camps, &c. as circumvallations, contravallations, redoubts, trenches, batteries, &c.

There are many modes of fortification that have been much esteemed and used; a small specimen of a comparative view of the principal of these is represented in plate 73, viz. those of count Pagan, and Mess. Vauban, Coehorn, Belidor, and Blondel; the explanation of which is as follows:

1. *Pagan's System.*

A Half bastions.
B Ravelin and counterguard.
C Counterguards before the bastions.
D The ditch.
E The glacis.
G The place of arms.
H Retired flanks.
a Line of defence.

2. *Vauban's System.*

b Angle of the bastion, or flanked angle.
c Angle of the shoulder.
d Angle of the flank.
e Saliant angle.
f Face of the bastion.
g The flank.
h The curtain.
i Tenailles.
k Traverses in the covert way.

3. *Coehorn's System.*

1 Concave flanks.
2 The curtains.
3 Redoubts in the re-entering angles.
4 Traverses.
5 Stone lodgments.
6 Round flanks.
7 Redoubt.
8 Coffers planked on the sides, and above covered overhead with a foot of earth.

4. *Belidor's System.*

I Cavaliers.
K Rams-horns, or Tenailles.
L Retrenchments within the detached bastions.
M Circular curtain.
N The ravelin.
P Lunettes with retired batteries.
Q Redoubt.
R Detached redoubt.
S An arrow.
P Small traverses.

5. *Blondel's System.*

I Retired battery.
m Lunettes.
n Ravelin, with retired bastion.
o Orillons.

Another, or new method of fortification, has lately been proposed by M. Montalambert, called Fortification Perpendiculaire, because the faces of the works are made by a series of lines running in a zig-zag, perpendicular to one another.

Profile of Fortification, is a representation of a vertical section of a work, serving to shew those dimensions which cannot be represented in plans, and are necessary in the building of a fortification. This profile is constructed in the following manner: provide a scale of equal parts, adapted to the perpendicular height of the work, e. gr. let *a*, *b*, Pl. 72. fig. 3, be a scale of twenty toises; and let AB represent the level of the ground plane, so that those parts of the fortification which are above the surface of the ground, or below it, may be above or below this line in the profile. From the point A, in the line AB, take AC=4 toises three feet, for the interior, talus or slope of the rampart; at C erect a perpendicular CD of three toises eighteen feet for the height of the rampart; through the point D draw an indefinite line DN parallel to AB, in which take DE=5 toises for the breadth of the terre-plein of the rampart: at the point E erect the perpendicular EF=2 feet for the height of the banquette, and draw FH parallel to DN, making FG and GH, each equal to three feet. Draw the line EG, which will represent the talus of the banquette, and GH will be the upper part of it: on the point H erect the perpendicular HI=4½ feet for the height of the parapet above the banquette. From I draw the indefinite line IK, parallel to DN, in which take IL=1½ foot, and draw HL, which will be the interior side of the parapet: take LK= toises for the thickness of the parapet, and from the point K let fall the indefinite line KP, perpendicular to the line AB, and produce it below AB: in this line take KM=2½ feet, and draw the line LM for the upper part of the parapet which is a talus, that the soldier on the banquette may be able to discover the covert-way and the glacis. On the point N, where DN intersects KP, as a center, with a radius of one foot, describe a small semi-circle, which represents the cordon: take NP=6 toises, and from the point P draw an indefinite line P n parallel to AB, which will represent the bottom of the ditch, the depth of which is supposed to be equal to the height of the rampart. Take NO=5 feet for the thickness of the revetement of the cordon, and from the point O draw the indefinite line O Q parallel to NP; this will be the interior side of the revetement of the point P, where the line P n meets the line NP; take PR=7 feet, or about the fifth part of its height NP, for the talus of the revetement, and draw the line NR, which represents the scarp or exterior side of the revetement; take RS=1 foot for the jutting of the foundation, and draw ST perpendicular to Pn, making it equal to two or three toises for the depth of the foundation, draw TQ parallel to Pn, and let it intersect OQ in Q; and let Y & be drawn parallel to NM, and at the distance of three feet, for the revetement of the parapet. In order to represent the

profile of the counterfort or buttress, when there is any, take OV=9 feet, and draw VX parallel to OQ; VX, QO, will represent this profile, by means of which the revetement OR is strengthened. That the terre-plein of the rampart may have a proper declivity, for carrying away the water which falls upon it, let DW be equal to 1½ foot, and draw WE, which will represent the upper part of the rampart, and the line AW represents the slope of its interior side. Suppose the breadth of the ditch to be twenty toises, and lay this down from P to n; and on the point n erect the perpendicular nm, terminated by the line AB at m, which will be the limit of the counterscarp. At the distance of three feet from this line, and parallel to it, draw zy, which will give the thickness of the revetement of the counterscarp; nu=3 feet will be the talus of this revetement, and the line um the exterior side of it. The foundation may be made to terminate at the distance of about six inches from the point u. Let mc=5 toises be the breadth of the covert-way, and at the point c erect a perpendicular cd =2 feet for the height of the banquette. Draw df parallel to AB, and equal to one toise, in which take de and ef, each equal to three feet.

Draw the line ce for the talus of the banquette, and ef will be the upper part of it: from the point f erect a perpendicular f l=4½ feet for the height of the parapet of the covert-way above the banquette. Produce f l till it cuts AB in r; take r g=20 toises for the breadth of the glacis; and draw lg, which will represent the glacis, or the declivity of the rampart of the covert-way: in this line take lh= 1 foot, and draw hf, which will be the interior side of the parapet of the covert-way; after which let there be a palisade constructed on the banquette, and the profile is finished.

Other profiles are given in Plate 73, fig. 2.

FO'RTIFIER. *s.* (from *fortify*.) 1. One who erects works of defence (*Carew*). 2. One who supports or secures (*Sidney*).

To FO'RTIFY. *v. a.* (*fortifier*, French.) 1. To strengthen against attacks by walls or works (*Shakspeare*). 2. To confirm; to encourage (*Sidney*). 3. To fix; to establish in resolution (*Locke*).

To FO'RTIFY. *v. n.* To raise strong places.

FORTILA'GE. *s.* (from *fort*.) A little fort; a blockhouse (*Spenser*).

FORTIN. *s.* (French.) A little fort, whose flanked angles are generally 120 fathoms distant from one another.

FORTISSIMO, in music, very loud or strong.

FORTITUDE, a virtue or quality of the mind, generally considered as the same with courage; though in a more accurate view they seem to be distinguishable. Courage may be a virtue or a vice, according to circumstances; fortitude is always a virtue: we speak of desperate courage, but not of desperate fortitude. A contempt or neglect of danger, without regard to consequences, may be called courage; and this some brutes have as well as we: in them it is the effect of natural instinct chiefly; in man it depends partly on habit, partly on strength of nerves, and partly on want of consideration. But fortitude is the virtue of a rational and considerate mind, and is founded in a sense of honour and a regard to duty. There may be courage in fighting a duel, though that folly is more frequently the effect of cowardice: there may be courage in an act of piracy or robbery; but there can be no fortitude in perpetrating a crime. Fortitude implies a love of equity and of public good; for, as Plato and Cicero observe, courage exerted for a selfish purpose, or without a regard to justice, ought to be called audacity rather than fortitude. This virtue takes different names, according as it acts in opposition to different sorts of evil; but some of those names are applied with considerable latitude. With respect to danger in general, fortitude may be termed intrepidity; with respect to the dangers of war, valour; with respect to pain of body or distress of mind, patience; with respect to labour, activity; with respect to injury, forbearance; with respect to our condition in general, magnanimity. The motives to fortitude are many and powerful. This virtue tends greatly to the happiness of the individual, by giving composure and presence of mind, and keeping the other passions in due subordination.

FO'RTLET. *s.* (from *fort*.) A little fort.

FO'RTNIGHT. *s.* (contracted from *fourteen night*.) The space of two weeks (*Bacon*).

FO'RTRESS. *s.* (*forteresse*, French.) A strong hold; a fortified place (*Locke*).

FORTROSE, a borough in Ross-shire, situate on the Frith of Murray, nearly opposite Fort George, and nine miles W. of Inverness.

FORTU'ITOUS. *a.* (*fortuit*, French, *fortuitus*, Latin.) Accidental; casual (*Ray*).

FORTU'ITOUSLY. *ad.* Accidentally; casually; by chance (*Rogers*).

FORTU'ITOUSNESS. *s.* (from *fortuitous*.) Accident; chance; hit.

FORTUNA, daughter of Oceanus, according to Homer, or one of the Parcæ according to Pindar, was the goddess of fortune, and from her hand were derived riches and poverty, pleasures and misfortunes, blessings and pains. She was worshipped in different parts of Greece. Bupalus was the first who made a statue of Fortune for the people of Smyrna, and he represented her with the polar star upon her head, and the horn of plenty in her hand. The Romans paid particular attention to the goddess of Fortune, and had no less than eight different temples erected to her honour in their city. Tullus Hostilius was the first who built her a temple. Her most famous temple in Italy was at Antium. She was worshipped among the Romans under different names, such as Female Fortune, Virile Fortune, Equestrian, Peaceful, Virgin, &c. The goddess is generally represented blind-folded, and holds a wheel in her hand as an emblem of her inconstancy. Sometimes she appears with wings.

FO'RTUNATE. *a.* (*fortunatus*, Latin.) Lucky; happy; successful (*Dryden*).

FORTUNATE ISLANDS, in ancient geography, certain islands concerning the situation of which authors are not agreed. They were famous for the golden apples of the Hesperides.

The common opinion is, that they are the Canary islands.

FO'RTUNATELY. *ad.* (from *fortunate.*) Happily; successfully (*Prior*).

FO'RTUNATENESS. *s.* (from *fortunate.*) Happiness; good luck; success (*Sidney*).

FO'RTUNE. *s.* (*fortuna*, Latin.) 1. The power supposed to distribute the lots of life according to her own humour (*Shakspeare*). 2. The good or ill that befalls man (*Bentley*). 3. The chance of life; means of living (*Swift*). 4. Success, good or bad; event (*Temple*). 5. Estate; possessions (*Shakspeare*). 6. The portion of a man or woman (*Otway*). 7. Futurity; future events (*Cowley*).

To FO'RTUNE. *v. a.* (from the noun.) To befall; to fall out; to happen; to come casually to pass (*Knolles*).

FO'RTUNED. *a.* Supplied by fortune (*Shakspeare*).

FO'RTUNEBOOK. *s.* (*fortune* and *book.*) A book consulted to know fortune (*Crashaw*).

FO'RTUNEHUNTER. *s.* (*fortune* and *hunt.*) A man whose employment is to inquire after women with great portions, to enrich himself by marrying them (*Spectator*).

To FO'RTUNETELL. *v. n.* (*fortune* and *tell.*) 1. To pretend to the power of revealing futurity (*Walton*). 2. To reveal futurity (*Cleaveland*).

FO'RTUNETELLER. *s.* (*fortune* and *teller.*) One who cheats common people, by pretending to the knowledge of futurity (*Duppa*).

By stat. 9 Geo. II. c. 5. fortunetellers are punishable with a year's imprisonment, and standing four times in the pillory.

FO'RTY. *a.* (feoperꝩiꝫ, Saxon.) Four times ten.

FORUM, in antiquity, is used in divers acceptations: sometimes for a place of traffic, answering to our market-place; in which sense it has usually some adjective added to it, as *forum boarium*, the beast market. Sometimes for any place, where the governor of a province convenes his people, to give judgment, according to course of law. At others, for a public standing place in the city of Rome, where causes were judicially tried, and orations delivered to the people.

FORUM, among casuists, is used for jurisdiction.

To FORWA'NDER. *v. a.* (*for* and *wander.*) To wander wildly and wearily (*Spenser*).

FO'RWARD. FO'RWARDS. *ad.* (ꝼoꝛpeaꝛꝺ, Saxon.) Toward a part or place before; onward; progressively, straight before (*Hooker*).

FO'RWARD. *a.* (from the adverb.) 1. Warm; earnest (*Galations*). 2. Ardent; eager; hot; violent (*Prior*). 3. Ready; confident; presumptuous (*Dryden*). 4. Not reserved; not over modest (*Shakspeare*). 5. Premature; early ripe (*Shakspeare*). 6. Quick; ready; hasty (*Locke*). 7. Antecedent; anterior (*Shakspeare*). 8. Not behindhand; not inferior (*Shakspeare*).

To FO'RWARD. *v. a.* (from the adverb.) 1. To hasten; to quicken; to accelerate in growth or improvement (*Swift*). 2. To patronise; to advance.

FO'RWARDER. *s.* (from *forward.*) He who promotes any thing.

FO'RWARDLY. *ad.* (from the adjective.) Eagerly; hastily; quickly (*Atterbury*).

FO'RWARDNESS. *s.* (from *forward.*) 1. Eagerness; ardour; readiness to act (*Bacon*). 2. Quickness; readiness (*Wotton*). 3. Earliness; early ripeness. 4. Confidence; assurance; want of modesty.

FOSS-WAY was anciently one of the four great Roman highways of England: so called, according to Camden, because it was ditched on both sides, which was the Roman method of making highways. It began at Totness in Devonshire, and ended at Barton upon Humber: being still visible in several parts, though of more than 1400 years standing.

FOSSA. (*fossa*, from *fodio*, to dig.) Fovea. A little depression or sinus.

FOSSA OVALIS. The depression in the right auricle of the human heart, which in the fetus opens into the other auricle, forming the foramen ovale.

FOSSA, in our ancient customs, was a ditch full of water, where women committing felony were drowned; as men were hanged.

FOSSANO, a strong town of Piedmont, with a bishop's see, seated on the Sture. Lat. 44. 45 N. Lon. 7. 56 E.

FOSSARII, in antiquity, a kind of officers in the Eastern church, whose business was to inter the dead.

FOSSE, in fortification, a ditch or moat. It lies between the scarp and counterscarp below the rampart.

FO'SSIL. *a.* (*fossilis*, Lat. *fossile*, French.) That is dug out of the earth (*Woodward*).

FOSSIL. (*fossilis*, from *fodio*, to dig.) Any thing dug out of the earth.

Native fossils, according to Dr. Hill, substances found either buried in the earth, or lying on its surface, of a plain simple structure, and shewing no signs of having contained vessels or circulating juices. These are subdivided by the same author, 1. Into fossils naturally and essentially simple. Of these, some are neither inflammable, nor soluble in water; as simple earths, talcs, fibrariæ, gypsum, selenitæ, crystals, and spars: others, though uninflammable, are soluble in water; as all the simple salts: and others, on the contrary, are inflammable, but not soluble in water; as sulphur, auripigmentum, zarnich, amber, ambergris, gagates, asphaltum, ampelites, lithanthrax, naphtha, and pisasphalta. 2. The second general subdivision of fossils, comprehends such as are naturally compound, but unmetallic. Of these, some are neither inflammable, nor soluble in water; as compound earths, stones, septariæ, siderochita, semi-pellucid gems, &c.: others are soluble in water, but not inflammable; as all the metallic salts: and lastly, some are inflammable, but not soluble in water; as marcasites, pyritæ, and phlogonia. 3. The third and last general division of fossils, comprehends all the metallic ores; which are bo-

dies naturally hard, remarkably heavy, and fusible in fire. Of these some are perfectly metallic, as being malleable when pure; such are gold, lead, silver, copper, iron and tin: others are imperfectly metallic, as not being malleable even in their purest state; such are antimony, bismuth, cobalt, zinc, &c. Of all these substances, the reader will find a particular description under their respective heads. See also GEOLOGY, and MINERALOGY.

Extraneous fossils are bodies of the vegetable or animal kingdoms accidentally buried in the earth. Of the vegetable kingdom there are principally three kinds, trees or parts of them, herbaceous plants, and corals; and of the animal kingdom there are four kinds, sea-shells, the teeth or bony palates and bones of fishes, complete fishes, and the bones of land animals. (See BONES, TREES, WOOD, PLANT, SHELL, &c.) These adventitious or extraneous fossils, thus found buried in great abundance in divers parts of the earth, have employed the curiosity of several of our latest naturalists, who have each a different system to account for the surprising appearances of petrified sea-fishes, in places far remote from the sea, and on the tops of mountains; shells in the middle of quarries of stone; and of elephants' teeth, and bones of various animals, peculiar to the southern climates, and plants only growing in the East, found fossil in our northern and western parts. On this subject we would beg leave to refer the reader to Parkinson's Organic Remains of a former World.

FOSSIL-PITCH. See PETROLEUM.

FOSSOMBRONE, a town of Italy, in the duchy of Urbino, with a bishop's see. Lat. 43. 40 N. Lon. 12. 48 E.

FOSTER (Samuel), an English mathematician, born in Northamptonshire, and educated at Cambridge, where he took his degrees in arts. In 1636 he was chosen professor of astronomy; in Gresham college, which, however, he resigned at the close of the same year, but in 1641 he was re-elected. He became one of the first members of that society, which afterwards was incorporated by royal charter, for encouraging experimental philosophy, and died in 1652. He wrote several mathematical treatises; the chief of which are, The Art of Dialling; Description of sundry Instruments, invented or improved by him; and Miscellanies. There were two other mathematicians of his name in the same century, viz. William Foster, who was a pupil of Oughtred, and afterwards a teacher in London; and Mark Foster, the author of a treatise on Trigonometry. (*Watkins*).

FOSTER (James), an English divine, born in 1697 at Exeter, and educated at the free-school of that city, from whence he was removed to an academy to perfect his studies. He commenced preacher in 1718, but when the disputes broke out in Exeter respecting the doctrine of the Trinity, he quitted that place and went to Melborne in Somersetshire. Afterwards he resided for some time at Trowbridge in Wiltshire, and in 1724 he was chosen to succeed Dr. Gale, at Barbican, having altered his sentiments respecting infant baptism, and been immersed in consequence of reading that writer's treatise on the subject. In 1744 he was chosen pastor of the church of Pinner's hall, and in 1748 the university of Mareschall college, Aberdeen, conferred on him the degree of D.D. He died in 1753, leaving a high character behind him for integrity and learning. His writings are; 1. A Defence of the Christian Revelation against Mr. Tindal. 2. Tracts on Heresy against Dr. Stebbing. 3. Several excellent Sermons, in 4 vols. 8vo. 4. Discourses on natural Religion and social Virtue, 2 vols. 4to. (*Watkins*).

To FO'STER. *v. a.* (ꝼoꞅꞇꞃıan, Saxon.) 1. To nurse; to feed; to support (*Cleaveland*). 2. To pamper (*Sidney*). 3. To cherish; to forward (*Thomson*).

FO'STERAGE. *s.* (from *foster*.) The charge of nursing; alterage (*Raleigh*),

FO'STERBROTHER. *s.* (ꝼoꞅꞇeꞃ bꞃoðeꞃ, Saxon.) One bred at the same pap.

FOSTERCHI'LD. *s.* (ꝼoꞅꞇeꞃ cılꝺ, Sax.) A child nursed by a woman not the mother, or bred by a man not the father (*Davies*).

FOSTERDA'M. *s.* (*foster* and *dam*). A nurse; one that performs the office of a mother (*Dryden*).

FOSTEREA'RTH. *s.* (*foster* and *earth*.) Earth by which the plant is nourished, though it did not grow at first in it (*Philips*).

FO'STERER. *s.* (from *foster*.) A nurse; one who gives food in the place of a parent (*Davies*).

FO'STERFATHER. *s.* (ꝼoꞅꞇeꞃ ꝼaꝺeꞃ, Saxon.) One who gives food in the place of the father.

FOSTERLEAN, anciently signified nuptial gifts; much the same with what we now call jointure.

FO'STERMOTHER. *s.* (*foster* and *mother*.) A nurse.

FOSTERSO'N. *s.* (*foster* and *son*.) One fed and educated, though not the son by nature.

FOTHERGILL (John), an eminent English physician, born in 1712 at Carr End, in Yorkshire, of reputable parents, who were by profession quakers. About 1728 he was placed apprentice to an apothecary at Bradford, and in 1736 he removed to London, where he studied two years in St. Thomas's hospital. From thence he went to Edinburgh, and took his doctor's degree. He afterwards went to Leyden, and travelled through some parts of France and Germany. About 1740 he commenced practice in London with great success, which continued to the very last. He was also admitted fellow of the college of physicians at Edinburgh, and a member of the royal and antiquarian societies of London. He greatly cultivated natural history and botany, and was a liberal patron of ingenious men. He was at the sole expence of printing Purver's translation of the scriptures into English, and an edition of bishop Percy's Key to the New Testament for a seminary of quakers in Yorkshire. He died in

1780, and was buried in the quaker's burying ground at Winchmore-hill. His shells and pieces of natural history were sold, by his own appointment, to the late Dr. Hunter, at 500l. under the valuation. His library was sold by auction. His Tracts were collected into one volume, by Dr. Elliott.

FOTHERGILLIA. In botany, a genus of the class polyandria, order monogynia. Calyx truncate, very entire; corolless; germ cloven; capsule two-celled; seeds solitary, bony. One species: a Caroline tree, resembling the alder; with alternate, wedge-formed leaves, serrate at top, hoary underneath, flowers in a very close terminal spike.

FOTHERING, a peculiar method of endeavouring to stop a leak in the bottom of a ship while she is afloat, either under sail or at anchor. It is usually performed in the following manner: A basket is filled with ashes, cinders, and chopped rope-yarns, and loosely covered with a piece of canvas; to this is fastened a long pole, by which it is plunged repeatedly in the water, as close as possible to the place where the leak is conjectured to lie. The oakum or chopped rope-yarns being thus gradually shaken through the twigs, or over the top of the basket, are frequently sucked into the hole along with the water, so that the leak becomes immediately choaked; and the ready entrance of the water is thereby prevented.

FOTHERINGAY, a town of Northamptonshire, nine miles S. of Stamford, near the river Nen. It is chiefly noted for the ruins of the castle, in which Mary queen of Scotland was beheaded.

FOU-TCHEOU-FOU, a city of China, in the province of Fo-kein. It carries on a considerable trade; but is chiefly remarkable for the magnificence of its principal bridge, which has more than 100 arches, constructed of white stone, and ornamented with a double balustrade throughout. This city is the residence of a viceroy, and has under its jurisdiction nine cities of the third class.

FOUCHIER (Bertram de), a Dutch painter, born at Bergen-op-Zoom in 1609, and a disciple of Vandyck. He afterwards travelled to Rome, where he studied the manner of Tintoretto. On his return to his own country he adopted the style of Brouwer, and painted portraits and conversations with great repute. He died in 1674.

FOVEOLATE, honey-combed; covered superficially with hollows nearly cubical.

FOUGA'DE. *s.* (French.) In the art of war, a sort of little mine in the manner of a well, dug under some work of fortification.

FOUGHT. The preterit and participle of *fight*.

FO'UGHTEN. The passive participle of *fight*.

FOVILLA, the fine, imperceptible substance discharged by the pollen of the anthers.

FOUL. *a.* (ful, Saxon.) 1. Not clean; filthy; dirty; miry (*Tillotson*). 2. Impure; polluted; full of filth (*Tillotson*). 3. Wicked; detestable; abominable (*Dryden*). 4. Not lawful (*Shakspeare*). 5. Hateful; ugly; loathsome (*Bacon*). 6. Disgraceful; shameful (*Milton*). 7. Coarse; gross (*Felton*). 8. Full of gross humours; wanting purgation or mundification (*Shakspeare*) 9. Not bright; not serene (*Dryden*). 10. With rough force; with unseasonable violence (*Clarendon*). 11. (Among seamen.) Entangled: as, *a rope is foul of the anchor.*

To FOUL. *v. a.* (fulan, Saxon.) To daub; to bemire; to make filthy; to dirty (*Evelyn*).

FOULA, or FOUL ISLAND, one of the Shetland isles, lying between six and seven leagues west from the main land. It is about three miles long, narrow, and full of rough, steep, and bare rocks; one of which is so large, and runs up to such an height, that it may be clearly seen from Orkney. This, therefore, may be reckoned with the greatest probability to be the Thule of Tacitus.

FOULAHS or FOOLAHS, a people in Africa, inhabiting a country on the confines of the great desert (see SAHARA) along the parallel of nine degrees north. They partake much of the negro form and complexion; but they have neither the jetty colour, thick lips, nor crisped hair of the negroes. They have also a language distinct from the Mandinga, which is the prevailing one in this quarter. The Foulahs occupy, at least as sovereigns, several provinces or kingdoms, interspersed throughout the tract comprehended between the mountainous border of the country Sierra Leona on the West, and that of Tombuctoo on the east; as also a large tract on the lower part of the Senegal river; and these provinces are insulated from each other in a very remarkable manner. Their religion is Mahometanism; but with a great mixture of Paganism, and with less intolerance than is practised by the Moors.

The principal of the Foulah states is that within Sierra Leona; and of which Teemboo is the capital. The next in order appears to be that bordering on the south of the Senegal river, and on the Jaloffs; this is properly named Siratik. Others of less note are Bondou, with Foota-Torra adjacent to it, lying between the rivers Gambia and Falemé; Foola-doo and Brooko along the upper part of the Senegal river; Wassela beyond the upper part of the Niger; and Massina lower down on the same river, and joining to Tombuctoo on the west.

The kingdom of the Foulahs, situated between the upper part of the Gambia river and the coast of Sierra Leona, and along the Rio Grande, is governed by a Mahometan sovereign; but the bulk of the people appear to be Pagans. From the circumstances of their long hair, their lips, and comparatively light colour, Major Rennel is decidedly of opinion, that the Foulahs are the Leucæthiops of Ptolemy and Pliny.

FOULFA'CED. *a.* (*foul* and *faced.*) Having an ugly or hateful visage (*Shakspeare*).

FOULI, or PHOLEY, a country of Africa,

situate on the sides of the river Senegal, and extending about 400 miles from E. to W.: the boundaries from N. to S. are unknown. It is populous and fertile. The inhabitants are, in general, of a tawny complexion, though many of them are entirely black. They lead a wandering life, and roam about the country with large droves of cows, sheep, goats, and horses. The king of this country is called the Siratick; and though he seldom appears with the badges of majesty, he has great authority, and is as much respected as any one on the coast. Elephants are extremely numerous in this country: the natives are very dextrous in catching them.

FO'ULLY. *ad.* (from *foul.*) 1. Filthily; nastily; odiously (*Hayward*). 2. Not lawfully; not fairly (*Shakspeare*).

FOULMO'UTHED. *a.* (*foul* and *mouth.*) Scurrilous; habituated to the use of opprobrious terms and epithets (*Addison*).

FOU'LNESS. *s.* (from *foul.*) 1. The quality of being foul; filthiness; nastiness (*Wilkins*). 2. Pollution; impurity (*Bacon*). 3. Hatefulness; atrociousness (*Ben Jonson*). 4. Ugliness; deformity (*Dryden*). 5. Dishonesty; want of candour (*Hammond*).

FOULNESS, an island separated by a narrow channel from the S. E. part of the county of Essex, six miles E. of Rochford.

FOULON (William), a Dutch Latin poet, born at the Hague, where he kept a school. He afterwards became a burgomaster at Horden in Friezeland, where he died in 1558, aged 75. He wrote three Latin comedies; 1. Martyrium Johannis Pistorii; 2. Hypocrysis, 1554; 3. Acolastus, de filio prodigo.

FOULSHAM, a town in Norfolk, with a market on Tuesdays. Lat. 52. 51 N. Lon. 1. 7 E

FOUMART, a species of MUSTELA.

FOUND. The pret. and part. passive of *find*.

To FOUND. *v. a.* (*fundare*, Latin; *fonder*, French.) 1. To lay the basis of any building (*Psalms*). 2. To build; to raise (*Davies*). 3. To establish; to erect (*Milton*). 4. To give birth or original to: as, he *founded* an art. 5. To raise upon, as on a principle or ground (*Decay of Piety*). 6. To fix firm (*Shakspeare*).

To FOUND. *v. a.* (*fundere*, Lat. *fondre*, French.) To form by melting and pouring into moulds; to cast (*Milton*).

FOUNDA'TION. *s.* (*fondation*, French.) 1. The basis or lower parts of an edifice. 2. The act of fixing the basis (*Tickel*). 3. The principles or grounds on which any notion is raised (*Tillotson*). 4. Original; rise (*Hooker*). 5. A revenue settled and established for any purpose, particularly charity (*Swift*). 6. Establishment; settlement.

FOUNDATION, that part of a building which is under-ground: or, that mass of stone, &c. which supports a building; or upon which the walls of the superstructure are raised: or, it is the coffer or bed, dug below the level of the ground, to raise a building upon.

The foundations of buildings are either natural or artificial. Natural, as when we build on a rock, or a very solid earth; in which case we need not seek for any farther strengthening. Artificial, where the ground is sandy, or marshy, or has lately been dug. In the former case, the architect must adjust the depth of the foundation by the height, weight, &c. of the building: a sixth part of the whole height is looked on as a medium; and as to thickness, double that of the width of the wall is a good rule. Architects ought to use the utmost diligence in regard to foundations, since of all errors which may happen in building, an error in this point is most pernicious. See ARCHITECTURE, part 3, sect. 2.

As to the rules necessary to be observed in constructing the ground-work, they are these: 1. That the bottom of the trench be made exactly level. 2. That the lowest ledge or row be all of stone, laid close together. 3. That the breadth of the ground-work be at least double that of the wall that is to be raised on it. However, art ought always to give way to discretion, for the breadth may be regulated according to the goodness of the ground, and the weight of the intended edifice. 4. That the foundation be made to diminish as it rises, only care must be taken that it do so equally on both sides. 5. That persons ought never to build upon the ruins of an old foundation, unless well assured of its depth and goodness.

FOUNDATIONS *of the piers of bridges*, are laid after different manners, according to the nature of the ground, depth and velocity of the water, &c. The conveniences used are BATTERDAUX, CAISSONS, &c.

Alberti, who is reckoned among the first who wrote on bridges, gives us the following directions for laying the foundation of a pier. "First raise an inclosure to keep off the water, by driving a double row of stakes very close and thick set, with their heads above the top of the water like a trench. Then put hurdles within this double row of stakes. Close that side of the row which is next to the intended pier, fill up the hollow between the two rows with rushes and mud, ramming them together so hard that no water can possibly get through. Then whatever you find within this inclosure, water, mud, sand, or whatever else is an hindrance to you, throw out, and dig till you come at a solid foundation. or, if you find it necessary, make a foundation of wooden piles burnt at the ends, and driven in as close together as possible. And here I have observed, that the best architects used to make a continued foundation of the whole length of the bridge, and not merely under each pier; and this they did, not by shutting out the whole river at once, by one single inclosure, but by first excluding one part, then another, and so joining the whole together by degrees: for it would be impossible to withstand and repel the whole force of the water at once. We must therefore, while we are at work in one part, leave another part open for a passage for the stream. You may leave these passages either in the

channel itself, or, if you think it more convenient, you may frame wooden dams or hanging channels, by which the superfluous water may run off: but if you find the expence of a continued foundation for the whole bridge too great, you may only make a separate foundation for every particular pier, in the form of a ship, with one angle in the stern and another in the head, lying directly even with the current of the water, that the force of the water may be broken by the angles. We are to remember that the water is much more dangerous to the stern than to the head of the pier." Palladio, who is the next writer, says, "To lay the foundations of pilasters, if the bed of the river be stone or gravel-stone, you have the foundation without any trouble; but in case the bottom be quicksand or gravel, you must dig therein, till you come to solid or firm ground; or, if that should be found too laborious or impracticable, you must dig moderately deep in the sand or gravel, and then you must thrust in oaken piles, which will reach the solid or firm ground, with the iron by which their points are to be armed. A part only of the bed of the river must be inclosed from the water, and then we are to build there; that the other part being left open, the water may have its free current; and so go on from part to part."

Many other early architects give rules to nearly the same purpose: but instead of inserting them, we shall describe the practice of one or two of the moderns. In the year 1753, the foundation of Essex-bridge in Dublin was laid in a very deep and rapid stream by Mr. Semple, who adopted the following method. Round the place where the intended pier was to rest, the workmen drove, at about 30 inches distance from each other both ways, two rows of strong piles, which were left at the height of low-water-mark. These piles were lined with planks, within which they rammed a quantity of clay, and thus formed the external wall of the coffer-dam. Within this wall, and at about the same distances, they drove in a row of piles dovetailed at their edges, so as to receive each other, and which formed the extremities of the plan of the piers, at the level of the bed of the river. After having dug to a fine stratum of sand about four feet lower, within these there were a great number of other piles of oak driven as deep as they possibly could be made to penetrate. They next filled up the voids or intervals of these piles; and in order to produce a solid and petrified foundation, they employed mortar of a peculiar quality, made up of roach lime and sharp gravel; and with this they began to lay the first course, ramming in large flat stones upon it to about a foot thick. On this first course they laid a plentiful coat of dry lime and gravel of the same quality, on which they again laid stones, and then proceeded to lay mortar as at first, and continued to do so alternately till they came to a perfect level with the piles. Fastened down to the end of these piles were laid three beams stretching the whole length of the pier from sterling to sterling, the intervals being filled up with masonry. On this platform, which was four feet six inches under low-water-mark, they began to lay the first course of stones for the pier, cramped together, and jointed with tarras as usual, and went forward till they came to a level with the water at ebb tide.

About the year 1765, the foundation of a stone bridge across the river Tees, near Stockton, was laid by Mr. Shout, and we shall here mention those few particulars in which his method differed from the preceding. The workmen began with first making very strong coffers of solid fir timber about ten feet square, which they piled, jointed, and secured one upon another, till they had gained a sufficient height to exclude the water at its highest tide. The joints of these timbers they caulked in the same manner as ships are; and launching them without any bottoms, they fixed them down to their respective stations in the river. On the outside and inside they drove a number of piles, which they boarded and rammed with clay, to prevent the water from oozing in at the bottom of the coffers. This indeed was their greatest difficulty, for, owing to quicksands, and other loose strata through which the water sprang in, the labour of digging to the proper kind of foundation was immense. The chain pumps played incessantly, and by a resolute perseverance, the work, which at some periods seemed to bid defiance to human industry and skill, was at length brought above low-water-mark, and the completion of the whole occupied a space of time nearly equal to Westminster bridge. The bridge is neat and plain, and continues to the present time a proof of the solidity of its foundation.

FO'UNDER. *s.* (from *found.*) 1. A builder; one who raises an edifice (*Dryden*). 2. One who establishes a revenue for any purpose (*Bentley*). 3. One from whom any thing has its original or beginning (*Roscommon*). 4. A caster; one who forms figures by casting melted matter into moulds (*Grew*).

To Fo'UNDER. *v. a.* (*fondre*, French.) To cause such a soreness and tenderness in a horse's foot, that he is unable to set it to the ground (*Dorset*).

To Fo'UNDER. *v. n.* (from *fond*, French.) 1. To sink to the bottom (*Raleigh*). 2. To fail; to miscarry (*Shakspeare*).

Fo'UNDER. In the manage, a disease of horses, by which they grow gradually contracted in their hoofs, and narrowed at their heels, putting their feet before each other with as much fear and caution as if they were moving upon a sheet of red-hot iron. This disease is often denominated *foot-founder*; it appears to be generally connected with what is called *chest-founder*, and is perhaps only a part of one common malady: the tenderness and rigidity of the forefoot extending through the whole course of the tendons and muscles that surround the leg and chest. The cause is not exactly known: it probably proceeds from excessive exercise frequently repeated on hard

roads, and especially in connection with the too frequent practice of cooling the horse's burning feet suddenly by immersion in cold water. The inflammatory symptoms should first be subdued, and the stiffness and debility attempted to be removed by friction and oleaginous stimulants.

FO'UNDERY. *s.* A place where figures are formed of melted metal; a casting-house.

FOUNDERY, or FOUNDRY, signifies also the art of casting all sorts of metals into different forms.

This art is exceedingly beneficial, as all metals must be subjected to it before they become fit for any useful purpose; but notwithstanding its application is so widely extended, its principles are simple, and we propose to explain them by a few examples, from which the reader may, by analogy, form an idea of the manner in which any other article is moulded and cast.

The great part of the founder's art consists in forming the moulds to receive the metal while in a state of fusion; the materials of these moulds are varied as the metal they are intended for requires. Sand, and loam or clay, are the materials most generally used for casting, as they are applicable to any metal and any subject; metal moulds are sometimes used, where a great number of the same article is to be cast, so that the duration of the moulds will compensate for the labour of making them. Artists who cast the valuable metals use a variety of compositions for making their moulds; but they are all employed in the same manner as the iron and brass founders employ sand and loam.

The sand used by the founders is of a loamy nature, containing a portion of clay sufficient to make it *cling* as they term it; that is, when the sand, rather damp, is squeezed up in the hand, it shall have sufficient adhesion to preserve any figure given to it. The founders near London procure their sand from the neighbourhood of Woolwich; but it is by no means a scarce article, almost every part of the country affording it, or the materials, viz. sand and loam; which may be mixed in proper proportions to give the requisite tenacity, at the same time that it is sufficiently dry to avoid the danger of an explosion, when the hot metal is poured in; an accident which sometimes happens when the sand contains too much water, from its sudden expansion when heated by the metal.

For moulding in sand, the founder must be provided with a number of frames, called boxes or flasks; these are made of wood or iron, and in shape corresponding to the article to be moulded in them. For an example we have chosen to explain the manner of moulding a pipe for the conveyance of water, having a flaunch or projecting ring at each end to connect it by means of screws with other similar pipes. To mould this the founder must be furnished with a *pattern*, that is a wooden pipe the same size and figure with that to be cast, except that instead of being bored out it has two pins *aa*, fig. 4. plate 74, projecting from its ends, which are of the same diameter as the bore of the pipe is intended to be. Their use will be explained shortly. This pattern is cut in half at line *bb*, and steady pins are put in to hold them together. A pair of flasks proper to contain sand for moulding. These are shewn in fig. 1, 2, and 3, of the plate. AA BB are two cast-iron frames open at bottom, and nearly the same shape as the pipe; when put together, these two will form a box, but wanting a top and bottom. The founder fills one of these flasks, BB, with sand, and rams it down moderately hard with the rammer K, fig. 6. he then forms a cavity with the trowel Z in the sand, sufficiently large to receive one of the halves of the pattern, fig. 4; this he places in the cavity, and rams the sand down close round its edges, and makes its surface level with the trowel Y. When the other half is placed upon the pattern, it is brought to the state represented by fig. 2. Dry sand which has been burnt is now strewed over the pattern and the sand in the lower flask BB, the upper flask is placed upon it, their joining being determined by four steady pins at *dd*, fig. 1, entering corresponding holes in the lower flask, fig. 2. The upper flask is now filled with sand through the opening in the top of it, and rammed in hard with L, fig. 6. Two wooden pins are thrust through the sand to reach the pattern, and being drawn out make two holes to pour the metal into the mould. The upper flask is now lifted up from the other with the sand in it, and as it parts from the other exactly at the place where the burnt sand was strewed, it contains an exact impression of one half of the pattern: and by lifting the pattern out of the sand in the lower flask, a print of the other half will be formed; so that when the two flasks are returned together, a cavity will be left between them the size and shape of the pattern; and the metal may be poured in through the holes before mentioned.

This method would be proper for moulding a solid article the shape of the pipe: but to form the bore or passage through it, a core must be inserted. This is a cylinder of dried clay, the size of the intended passage, and the length of the extreme ends of the pins *aa*; its size is therefore denoted by the dotted lines in fig. 4. The end of the core is inserted into the impressions of the pins *aa*, which it exactly fits, as is shewn in fig. 1. By this means, when the two flasks are put together, a cavity is left all round the core, as is shewn by the dark circle in fig. 5; which is a cross section of the mould put together. The core is made upon an iron bar, which is laid in a frame where it can be turned round by a handle. Hay bands are then wound round it till it becomes nearly the required size. Wet clay is next spread upon it, and smoothed at the same time that it is turned round, till it is made a true and straight cylinder; it is next dried in a stove, by making a fire beneath it. Afterwards another coat of very fine loam is spread upon it, to close up the cracks which will most probably be found in the first coat by the shrinkage of the loam in drying: the last covering brings the cylinder to the true diameter, and when dry it is finished. Now it is evident that if the pins *aa* are in the proper places, and of the true size, the thickness of the metal will be the same all round the pipe.

The moulder must take care, in every case of sand casting, to make a small hole away from all the highest parts of the pattern, to allow a retreat for the air, when the metal is poured in; otherwise the rarefaction of the air would burst the mould in the pipe; for example, these vents must be made from the highest part of each flaunch by a wire pushed through the sand; two holes should be made for the entrance of the metal, and when the mould is cast, the metal must be poured in from a ladle at one hole; and when it is seen to rise up in the other, the stream is stopped.

The melting of the metal is performed in various

furnaces, as the nature of the metal requires more or less heat to fuse it.

Iron is melted either in a blast furnace or cupola, which is a small cylindric furnace blown by bellows or otherwise: and the metal and fuel are put in together at top; and when melted the metal is let out at bottom, and conveyed to the mould by a channel in the sand, if the work is large; or, if smaller, it is received into a ladle called a shank, shewn at X, in fig. 6. It has three handles, and is carried between two men, the double handles *k* are very convenient for inclining the ladle to pour out the metal. It contains about an hundred weight; but for smaller quantities a single-handed ladle is employed. For very heavy castings the metal is fused in what is called a reverberating furnace acting by the flame of the fuel alone. Brass and the more valuable metals are melted in crucibles, heated either in the blast furnace or in the air furnace, which is described in our article BRASS FOUNDERY. As the cupola and reverberating furnaces are used in numerous other processes in the arts, besides foundery, we shall describe their construction under the article FURNACE.

The sand moulds above described, by having two or more flasks one upon the other, and dividing the pattern into several parts, are applicable to a very large proportion of the articles which come before the founder: but it is here proper to make the distinction between wet and dry sand. The former is used where the intricacy of the pattern requires the sand to be wetted to give it sufficient adhesion, and preserve its figure. When a mould of this kind is finished, it must be dried in a stove to evaporate the water, before the casting. Dry sand is used for more simple patterns, and requires no more water than may be suffered to remain in the mould when cast without danger.

Loam is also a material used by founders for making their moulds, when they are required of such dimensions that the weight of so large a body of sand would be too great to support itself if rammed in flasks; also for others which are too complicated to be moulded in sand: the loam is clay well mixed up with water, which is moulded while in a soft state and afterwards dried. To explain the art of moulding in loam, we shall describe the manner of making a mould for a large hemispherical boiler; and the reader will easily perceive that a similar method is applicable to large bells, cylinders, cisterns, and many other articles. AA, fig. 8, pl. 74, represents the shape of the boiler which is to be cast, in an inverted state. The founder provides a round iron ring L, fig. 7, somewhat larger than the intended boiler; upon this ring he erects a dome of brick work BB, fig. 9, rather smaller than the inside of the boiler; when this is completed, an axis DD is erected, turning on pivots at its ends. The socket for the lower pivot is fixed in a stake driven in the ground beneath the dome, and the upper pivot turns in a socket fixed to the beam EE, in the roof of the building. The axis DD has an arm F sliding upon it, which can be fixed at any height by a screw. To this arm a piece of board G is screwed; and its internal edge cut out to the curve the intended boiler is to have, and with a notch in the lower part proper to fit to the ring *a* at the bottom. After this preparation the moulder spreads a layer of wet loam upon the dome of brick work; and by turning the board G, and its axis D round, the loam will be scraped round to its true figure. By this means, in a short time, a core is formed the proper size to shape the inside of the vessel; and it is dried by making a fire beneath it. Another dome is now constructed in the same manner, but the size and figure of the outside of the vessel: and upon this any rings, ornaments, &c. which are required, must be engraved. When dried, this dome must be painted over with a blacking made of charcoal ground up with water, and a good thickness of loam is spread upon it. Iron wire and old hoops are worked up in it, to give it the necessary strength. After drying this outer coat, the whole is turned over, and the bricks and loam of the first operation are removed; leaving a hollow shell, as the blacking prevents a connection of the two layers of loam. CCC, fig. 9, is a section of this shell, shewing the manner in which it is placed over the core BB, so as to leave the dark space for the reception of the metal, which is poured in through two or more holes at *dd*. The mould must be buried in a pit, and covered up with sand: long round sticks are set up in the holes *dd*, to keep the sand out of them: when drawn out they leave passages through the sand, down which the metal is conveyed to the mould. Iron rings R, fig. 6. are laid round the tops of the passages to prevent the metal breaking away the sand by its weight. The metal is always conveyed to such large moulds in channels cut out in the sand from the top hole of the furnace to the orifice of the mould.

A square cistern might be moulded in a similar manner by bricks and loam; and, with a reasonable share of ingenuity, a founder will be able to form a mould for any article he meets with.

FOUNDERY (Brass). The art of casting brass is a distinct business from iron foundery, though the manner of moulding any article to be cast in brass is the same as for iron; the difference lies in the manner of treating the metal in the furnace. Under our article BRASS will be found an extract from Dr. Rees' Cyclopedia, describing the process of making brass as practised in Flintshire; we are now enabled to lay before our reader drawings of the furnace used for this process at Mr. Bennet's brass works, Sheffield. The copper which is to be converted into brass is brought to the works in a granulated state, called shot copper, made by melting the copper and throwing it into cold water: 52 pounds of copper in this state are mixed with 80 pounds of calamine previously prepared by calcination, which is performed in a reverberating furnace three yards long, two yards wide, and the roof 18 inches high; the calamine being thrown into the furnace, and the flame of pit coal reverberated upon it from the roof of the furnace. In this manner it is exposed to a considerable heat for about four hours, the attendant continually stirring it about with an iron hoe, and turning it over, that every particle may be equally subjected to the action of the fire. By this operation the calamine is deprived of its sulphur, which passes off up the chimney, and is precipitated on the ground around the furnace in such quantities as to be a considerable annoyance to any inhabitants of its vicinity. The calamine loses in weight by the calcination: the large lumps of calamine are now broken by a hammer, and the whole ground to a fine powder between mill-stones like those used for grinding wheat; in this state the calamine is ready for making common brass. But for making the best brass which is to be rolled or drawn into wire, the calamine must be washed first before grinding. It is washed in a cistern called a buddle, about six feet square, and 12 inches deep. A small stream of clean water is brought on, on one side, and the waste flows out at the other. The calamine being thrown into this buddle, and well

raked about, the water carries off a portion of calamine: by which separation the remainder is found to be greatly improved for the purpose of brass making. One bushel of pit-coal, ground to a fine powder, is now mixed up with 52 pounds of shot copper, and 82 of prepared calamine; the mixture is put in nine crucibles, one of which is shewn at fig. 4, Plate 75. The crucibles are now placed in the furnace, eight of them are ranged in a circle round the inside of the furnace as shewn at *aaa* in plan, fig. 1, and the ninth is placed in the center. The body of the furnace AA, fig. 1, 2, is nearly in the form of half an egg, that is, semi-spheroidal. The floor BB is an iron plate covered with clay and perforated with 12 small holes, denoted by dots in the plan, to bring up the supply of air. The top of the furnace has a round hole in it to introduce the crucibles and fuel, which is enclosed by a cover D, made of fine clay, with a small hole in the center. EE is the flue forming a communication from the top of the furnace to the chimney, to convey away the smoke, and cause a draught. The furnace is supplied with fresh air through the holes in the bottom of the furnace from a large draught arch FF, which communicated with the open air. After the crucibles are placed in the furnace, a small quantity of furzens is thrown down to prevent the 12 holes from being stopped up by the coals with which the furnace, is now filled. As it was heated red hot previous to being charged, the coals are quickly fired and the whole burns rapidly; the fire is continued for about twelve hours, the manager regulates its heat from his experience of former processes, and forms his judgment of the actual state of the furnace from the appearance and colour of the small stream of flame which issues from the small hole *d* in the cover of the furnace mouth, when a damper at K in the flue E is closed so as to stop the current of air going up the chimney. He increases or diminishes the heat at pleasure, by opening or closing this damper, and thus regulating the draught. After the fire has been continued about 12 hours, the crucibles are taken out by the tongs fig. 3 which have curved jaws *kk*, to embrace each crucible, and the contents of all the eight crucibles poured into the centre one, from thence, it is run into ingot moulds, fig. 5, each of the ingots thus formed will weigh about six pounds, and the whole quantity of brass produced by the operation is about 80 pounds. The body of the furnace at AA is lined with fire-brick, and an iron ring is laid round the mouth, and upon which the cover shuts. The crucibles are made of Stourbridge clay, mixed up with old glass melting-pots, first reduced to a powder. An extensive brass work contains several furnaces which are arranged in two rows parallel to each other, and at such a distance apart, that the flues of both rows may be carried up in the same stack of chimnies. Sometimes the brass is poured into moulds at once. Fig. 6 shews a pair of flasks, AA the upper, BB the lower; *aa* the pins to put them together, *bb* the holes for the metal.

FOUNDERY OF BELLS. The metal, it is to be observed, is different for bells from what it is for statues, there being no tin in the statue-metal: but there is a fifth, and sometimes more, in the bell-metal.

The dimensions of the core and the wax for bells, if a ring of bells especially, are not left to chance, but must be measured on a scale or diapason, which gives the height, aperture, and thickness necessary for the several tones required.

It is on the wax that the several mouldings and other ornaments and inscriptions, to be represented in relievo on the outside of the bell, are formed. The clapper or tongue is not properly a part of the bell, but is furnished from other hands. In Europe it is usually of iron, with a large knob at the extremity; and is suspended in the middle of the bell. In China, it is only a huge wooden mallet, struck by force of arm against the bell; whence they can have but little of that consonancy so much admired in some of our rings of bells. The Chinese have an extraordinary way of increasing the sound of their bells; viz. by leaving a hole under the cannon; which our bell-founders rather reckon a defect.

The proportions of our bells differ very much from those of the Chinese. In ours, the modern proportions are, to make the diameter fifteen times the thickness of the brim, and the height twelve times. The parts of a bell are, 1. The sounding bow, terminated by an inferior circle, which grows thinner and thinner. 2. The brim, or that part of a bell whereon the clapper strikes, and which is thicker than the rest. 3. The outward sinking of the middle of the bell, or the point under which it grows wider to the brim. 4. The waist or furniture, and the part that grows wider and thicker quite to the brim. 5. The upper vase, or that part which is above the waist. 6. The pallet which supports the staple of the clapper within. 7. The bent and hollowed branches of metal uniting with the cannons, to receive the iron keys, whereby the bell is hung up to the beam, which is its support and counterpoise, when rung out.

The business of bell-foundery is reducible to three particulars. 1. The proportion of a bell. 2. The forming of the mould. And, 3. The melting of the metal. There are two kinds of proportions, viz. the simple and the relative; the former are those proportions only that are between the several parts of a bell to render it sonorous; the relative proportions establish a requisite harmony between several bells.

The method of forming the profile of a bell, previous to its being cast, in which the proportion of the several parts may be seen, is as follows: The thickness of the brim, C1 in Plate 76, is the foundation of every other measure, and is divided into three equal parts. First, draw the line HD, which represents the diameter of the bell; bisect it in F, and erect the perpendicular F*f*; let DF and HF be also bisected in E and G, and two other perpendiculars E*e*, G*a*, be erected at E and G: GF will be the diameter of the top or upper vase, *i. e.* the diameter of the top will be half that of the bell; and it will therefore be the diameter of a bell which will sound an octave to the other. Divide the diameter of the bell, or the line HD, into fifteen equal parts, and one of these will give C1 the thickness of the brim; divide again each of these fifteen equal parts into three other equal parts, and then form a scale. From this scale take twelve of the larger divisions or $\frac{4}{5}$ of the whole scale in the compass, and, setting one leg in D, describe an arc to cut the line E*e* in N; draw ND, and divide this line into twelve equal parts; at the point 1 erect the perpendicular 1C=10, and C1 will be the thickness of the brim $=\frac{1}{15}$ of the diameter: draw the line CD: bisect DN; and at the point of bisection 6 erect the perpendicular $6K=1\frac{1}{2}$ of the larger divisions on the scale. With an opening of the compass equal to twice the length of the scale or thirty brims, setting one leg in N, describe an arc of a circle, and with the

same leg in K and the same opening describe another arc to intersect the former: on this point of intersection as a centre, and with a radius equal to thirty brims, describe the arc NK; in 6K produced take CB=$\frac{1}{4}$ of the larger measure of the scale, or $\frac{1}{4}$ of the brim, and on the same centre with the radius 30$\frac{1}{4}$ brims describe an arc AB parallel to NK. For the arc BC, take twelve divisions of the scale, or twelve brims in the compass; find a centre, and from that centre, with this opening, describe the arc BC, in the same manner as NK or AB were described There are various ways of describing the arc K*p*; some describe it on a centre at the distance of nine brims from the points *p* and K; others, as it is done in the figure, on a centre at the distance only of seven brims from those points. But it is necessary first to find the point *p*, and to determine the rounding of the bell *p*1. For this purpose, on the point C as a centre, and with the radius C1, describe the arc 1*pn*; bisect the part 1 2 of the line D*n*, and, erecting the perpendicular *pm*, this perpendicular will cut the arc 1*pn* in *m*, which terminates the rounding 1*p*. Some founders make the bendings K a third of a brim lower than the middle of the line DN; others make the part C1D more acute; and, instead of making C1 perpendicular to DN at 1, draw it $\frac{1}{6}$th of a brim higher, making it still equal to one brim; so that the line 1D is longer than the brim C1. In order to trace out the top-part N*a*, take in the compass eight divisions of the scale or eight brims, and on the points N and D as centres, describe arcs to intersect each other in 8: on this point 8, with a radius of eight brims, describe the arc N*b*; this arc will be the exterior curve of the top or crown: on the same point 8 as a centre, and with a radius equal to 7$\frac{2}{3}$ brims, describe the arc A*c*, and this will be the interior curve of the crown, and its whole thickness will be one-third of the brim. As the point 8 does not fall in the axis of the bell, a centre M may be found in the axis by describing, with the interval of eight brims on the centres D and H, arcs which will intersect in M; and this point may be made the centre of the inner and outer curves of the crown as before. The thickness of the cap which strengthens the crown at Q is about one-third of the thickness of the brim; and the hollow branches or ears about one-sixth of the diameter of the bell. The height of the bell is in proportion to its diameter as twelve to fifteen, or in the proportion of the fundamental sound to its third major: whence it follows, that the sound of a bell is principally composed of the sound of its extremity or brim, as a fundamental of the sound of the crown which is an octave to it, and of that of the height which is a third.

The particulars necessary for making the mould of a bell are, 1. The earth: the most cohesive is the best; it must be well ground and sifted, to prevent any chinks. 2. Brick-stone, which must be used for the mine, mould, or core, and for the furnace. 3. Horse-dung, hair, and hemp, mixed with the earth, to render the cement more binding. 4. The wax for inscriptions, coats of arms, &c. 5. The tallow equally mixed with the wax, in order to put a slight lay of it upon the outer mould, before any letters are applied to it. 6. The coals to dry the mould.

For making the mould, the workmen have a scaffold consisting of four boards, ranged upon tressels. Upon this they carry the earth, grossly diluted, to mix it with horse-dung, beating the whole with a large spatula.

The compasses of construction is the chief instrument for making the mould, which consist of two different legs joined by a third piece. And, last of all, the founders' shelves, on which are the engravings of the letters, cartridges, coats of arms, &c.

They first dig a hole of a sufficient depth to contain the mould of the bell, together with the case or cannon, under ground; and about six inches lower than the terreplain, where the work is performed. The hole must be wide enough for a free passage between the mould and walls of the hole, or between one mould and another, when several bells are to be cast. At the centre of the hole is a stake erected, that is strongly fastened in the ground. This supports an iron peg, on which the pivot of the second branch of the compasses turns. The stake is encompassed with a solid brick-work, perfecly round, about half a foot high, and of the proposed bell's diameter. This they call a mill-stone. The parts of the mould are, the core, the model of the bell, and the shell. When the outer surface of the core is formed, they begin to raise the core, which is made of bricks that are laid in courses of equal height upon a lay of plain earth. At the laying of each brick, they bring near it the branch of the compasses, on which the curve of the core is shaped, so as that there may remain between it and the curve the distance of a line, to be afterwards filled up with layers of cement. The work is continued to the top, only leaving an opening for the coals to bake the core. This work is covered with a layer of cement, made of earth and horse-dung; on which they move the compasses of construction, to make it of an even smoothness every where.

The first layer being finished, they put the fire to the core, by filling it half with coals, through an opening that is kept shut during the baking, with a cake of earth that has been separately baked. The first fire consumes the stake, and the fire is left in the core half or sometimes a whole day: the first layer being thoroughly dry, they cover it with a second, third, and fourth; each being smoothed by the board of the compasses, and thoroughly dried before they proceed to another.

The core being completed, they take the compasses to pieces, with intent to cut off the thickness of the model; and the compasses are immediately put in their place to begin a second piece of the mould. It consists of a mixture of earth and hair, applied with the hand on the core, in several cakes that close together. This work is finished by several layers of a thinner cement of the same matter, smoothed by the compasses, and thoroughly dried before another is laid on. The first layer of the model is a mixture of wax and grease spread over the whole. After which are applied the inscriptions, coats of arms, &c. besmeared with a pencil dipped in a vessel of wax in a chafing-dish: this is done for every letter. Before the shell is begun, the compasses are taken to pieces, to cut off all the wood that fills the place of the thickness to be given to the shell.

The first layer is the same earth with the rest, sifted very fine; whilst it is tempering in water, it is mixed with cow's hair to make it cohere. The whole being a thin matter is gently poured on the model, that fills exactly all the sinuosities of the figures, &c.; and this is repeated till the whole is two lines thick over the model. When this layer is thoroughly dried, they cover it with a second of the same matter, but somewhat

thicker; when this second layer becomes of some consistence, they apply the compasses again, and light a fire in the core, so as to melt off the wax of the inscriptions, &c.

After this, they go on with other layers of the shell, by means of the compasses. Here they add to the cow's hair a quantity of hemp, spread upon the layers, and afterwards smoothed by the board of the compasses. The thickness of the shell comes to four or five inches lower than the mill-stone before observed, and surrounds it quite close, which prevents the extravasation of the metal. The wax should be taken out before the melting of the metal.

The ear of the bell requires a separate work, which is done during the drying of the several incrustations of the cement. It has seven rings: the seventh is called the bridge, and unites the others, being a perpendicular support to strengthen the curves. It has an aperture at the top, to admit a large iron peg bent at the bottom; and this is introduced into two holes in the beam, fastened with two strong iron keys. There are models made of the rings, with masses of beaten earth, that are dried in the fire, in order to have the hollow of them. These rings are gently pressed upon a layer of earth and cow's hair, one half of its depth, and then taken out without breaking the mould. This operation is repeated twelve times for twelve half-moulds, that two and two united may make the hollows of the six rings: the same they do for the hollow of the bridge, and bake them all, to unite them together.

Upon the open place left for the coals to be put in, are placed the rings that constitute the ear. They first put into this open place the iron ring to support the clapper of the bell; then they make a round cake of clay, to fill up the diameter of the thickness of the core. This cake, after baking, is clapped upon the opening, and soldered with a thin mortar spread over it, which binds the cover close to the core.

The hollow of the model is filled with an earth, sufficiently moist to fix on the place, which is strewed at several times upon the cover of the core; and they beat it gently with a pestle, to a proper height; and a workman smooths the earth at top with a wooden trowel dipped in water.

Upon this cover, to be taken off afterwards, they assemble the hollows of the rings. When every thing is in its proper place, they strengthen the outside of the hollows with mortar, in order to bind them with the bridge, and keep them steady at the bottom, by means of a cake of the same mortar, which fills up the whole aperture of the shell. This they let dry, that it may be removed without breaking. To make room for the metal, they pull off the hollows of the rings, through which the metal is to pass before it enters into the vacuity of the mould. The shell being unloaded of its ear, they range under the mill-stone five or six pieces of wood, about two feet long, and thick enough to reach almost the lower part of the shell: between these and the mould they drive in wooden wedges with a mallet, to shake the shell of the model whereon it rests, so as to be pulled up and got out of the pit.

When this and the wax are removed, they break the model and the layer of earth, through which the metal must run, from the hollow of the rings, between the shell and the core. They smoke the inside of the shell, by burning straw under it, that helps to smooth the surface of the bell. Then they put the shell in the place, so as to leave the same interval between that and the core; and before the hollows of the rings or the cap are put on again, they add two vents, that are united to the rings, and to each other, by a mass of baked cement. After which they put on this mass of the cap, the rings, and the vent, over the shell, and solder it with thin cement, which is dried gradually by covering it with burning coals. Then they fill up the pit with earth, beating it strongly all the time round the mould.

The furnace has a place for the fire, and another for the metal. The fire-place has a large chimney with a spacious ash-hole. The furnace which contains the metal is vaulted, and its bottom is made of earth, rammed down; the rest is built with brick. It has four apertures; the first, through which the flame revibrates; the second is closed with a stopple that is opened for the metal to run; the others are to separate the dross or scoriæ of the metal by wooden rakes: through these last apertures passes the thick smoke. The ground of the furnace is built sloping, for the metal to run down.

Foundery of Great Guns and Mortar-Pieces. The method of casting these pieces is little different from that of bells: they are run massy, without any core, being determined by the hollow of the shell; and they are afterwards bored with a steel trepan, that is worked either by horses, a water-mill, or a steam-engine. See farther the article GUNNERY.

Letter-Foundery, or Casting of Types for Printing. In the business of cutting, casting, &c. letters for printing, the letter-cutter must be provided with a vice, hand-vice, hammers, and files of all sorts for watch-makers' use; as also gravers and sculpters of all sorts, and an oil-stone, &c. suitable and sizeable to the several letters to be cut: a flat gage made of box to hold a rod of steel, or the body of a mould, &c. exactly perpendicular to the flat of the using file: a sliding-gage, whose use is to measure and set off distances between the shoulder and the tooth, and to mark it off from the end, or from the edge of the work: a face-gage, which is a square notch cut with a file into the edge of a thin plate of steel, iron, or brass, of the thickness of a piece of common tin, whose use is to proportion the face of each sort of letter, viz. long letters, ascending letters, and short letters. So there must be three gages, and the gage for the long letters is the length of the whole body supposed to be divided into 42 equal parts. The gage for the ascending letters Roman and Italic are $\frac{5}{7}$, or 30 parts of 42, and 33 parts for the English face. The gage for the short letters is $\frac{3}{7}$, or 18 parts of 42 of the whole body for the Roman and Italic, and 22 parts for the English face.

The Italic and other standing gages are to measure the scope of the Italic stems, by applying the top and bottom of the gage to the top and bottom lines of the letters, and the other side of the gage to the stem; for when the letter complies with these three sides of that gage, it has its true shape.

The next care of the letter-cutter is to prepare good steel punches, well tempered, and quite free from all veins of iron; on the face of which he draws or marks the exact shape of the letter with pen and ink, if the letter be large, or with a smooth blunted point of a needle if it be small; and then with sizeable, and proper shaped and pointed gravers and sculpters, digs or sculps out the steel between the strokes or marks so made on the face of the punch, and leaves the marks stand-

ing on the face. Having well shaped the inside strokes of his letter, he deepens the hollows with the same tools; for, if a letter be not deep in proportion to its width, it will, when used at press, print black, and be good for nothing. This work is generally regulated by the depth of the counter punch. Then he works the outside with proper files till it be fit for the matrice.

But before we proceed to the sinking and justifying of the matrices, we must provide a mould to justify them by, of which you have draughts in Plate 76. fig. 2 and 3. Every mould is composed of an upper and under part. The under part is delineated in fig. 2. The upper part is marked fig. 3, and is in all respects made like the under part, excepting the stool behind, and the bow or spring also behind; and excepting a small roundish wire between the body and carriage, near the break, where the under part hath a small rounding groove made in the body. This wire, or rather half-wire, in the upper part makes the nick in the shank of the letter, when part of it is received into the groove in the under part. These two parts are so exactly fitted and gaged into one another (viz. the male-gage marked *c* in fig. 3. into the female marked *g* in fig. 2.) that when the upper part of the mould is properly placed on, and in the under part of the mould, both together make the entire mould, and may be slid backwards for use so far, till the edge of either of the bodies on the middle of either carriage comes just to the edge of the female gages cut in each carriage: and they may be slid forward so far, till the bodies on either carriage touch each other: and the sliding of these two parts of the mould backwards makes the shank of the letter thicker, because the bodies on each part stand wider asunder; and the sliding them forwards makes the shank of the letter thinner, because the bodies on each part of the mould stand closer together. The parts of the mould are as follow: viz. a, The carriage. b, The body. c, The male gage. d e, The mouth-piece. f, The register. g, The female gage. h h, The hag. *aaaa*, The bottom plate. *bbb*, The wood on which the bottom plate lies. *ccc*, The mouth. *dd*, The throat. *edd*, The pallat. *f*, The nick. *gg*, The stool. *hh*, The spring or bow.

Then the mould must be justified: and first the founder justifies the body, by casting about 20 proofs or samples of letters; which are set up in a composing stick, with all their nicks towards the right hand; and then, by comparing these with the pattern letters, set up in the same manner, he finds the exact measure of the body to be cast. He also tries if the two sides of the body are parallel, or that the body be no bigger at the head than at the foot, by taking half the number of his proofs and turning them with their heads to the feet of the other half; and if then the heads and the feet be found exactly even upon each other, and neither to drive out nor get in, the two sides may be pronounced parallel. He farther tries whether the two sides of the thickness of the letter be parallel, by first setting his proofs in the composing stick with their nicks upwards, and then turning one half with their heads to the feet of the other half; and if the heads and feet lie exactly upon each other, and neither drive out nor get in, the two sides of the thickness are parallel.

The mould thus justified, the next business is to prepare the matrices. A matrice is a piece of brass or copper, of about an inch and a half long, and of a thickness in proportion to the size of the letter it is to contain. In this metal is sunk the face of the letter intended to be cast, by striking the letter-punch about the depth of an n. After this, the sides and face of the matrice must be justified and cleared with files of all bunchings made by sinking the punch.

Every thing thus prepared, it is brought to the furnace; which is built of brick upright, with four square sides, and a stone on the top, in which stone is a wide round hole for the pan to stand in. A foundery of any consequence has several of these furnaces in it.

As to the metal of which the types are to be cast, this, in extensive founderies, is always prepared in large quantities; but cast into small bars of about 20 pounds weight, to be delivered out to the workmen as occasion requires. In the letter-foundery under the direction of Dr. Alex. Wilson and Sons at Glasgow, we are informed, that a stock of metal is made up at two different times of the year, sufficient to serve the casters at the furnace for six months each time. For this purpose, a large furnace is built under a shade, furnished with a wheel vent, in order the more equally to heat the sides of a strong pot of cast-iron, which holds when full 15 hundred weight of the metal. The fire being kindled below, the bars of lead are let softly down into the pot, and their fusion promoted by throwing in some pitch and tallow, which soon inflame. An outer chimney, which is built so as to project about a foot over the farthest lip of the pot, catches hold of the flame by a strong draught, and makes it act very powerfully in melting lead; whilst it serves at the same time to convey away all the fumes, &c. from the workmen to whom this laborious part of the business is committed. When the lead is thoroughly melted, a due proportion of the regulus of antimony and other ingredients is put in, and some more tallow is inflamed to make the whole incorporate sooner. The workmen now having mixed the contents of the pot very thoroughly by stirring long with a large iron ladle, next proceed to draw the metal into the small troughs of cast-iron, which are ranged to the number of fourscore upon a level platform faced with stone, built towards the right hand. In the course of a day, 15 hundred weight of metal can be easily prepared in this manner; and the operation is continued for as many days as are necessary to prepare a stock of metal of all the various degrees of hardness. After this, the whole is disposed into presses according to its quality, to be delivered out occasionally to the workmen.

The founder must now be provided with a ladle, which differs nothing from other iron ladles but in its size; and he is provided always with ladles of several sizes, which he uses according to the size of the letters he is to cast. Before the caster begins to cast, he must kindle his fire in the furnace to melt the metal in the pan. Therefore he takes the pan out of the hole in the stone, and there lays in coals and kindles them; and, when they are well kindled, he sets the pan in again, and puts in metal into it to melt: if it be a small-bodied letter he casts, or a thin letter of great bodies, his metal must be very hot; nay, sometimes red hot, to make the letter come. Then having chosen a ladle that will hold about so much as the letter and break is, he lays it at the stoking hole, where the flame bursts out, to heat. Then he ties a thin leather, cut with its narrow end against the face to the leather groove of the ma-

trice, by whipping a brown thread twice about the leather groove, and fastening the thread with a knot. Then he puts both halves of the mould together, and puts the matrice into the matrice-cheek, and places the foot of the matrice on the stool of the mould, and the broad end of the leather upon the wood of the upper half of the mould, but not tight up, lest it might hinder the foot of the matrice from sinking close down upon the stool in a train of work. Then laying a little rosin on the upper wood of the mould, and having his casting-ladle hot, he with the boiling side of it melts the rosin: and, while it is yet melted, presses the broad end of the leather hard down on the wood, and so fastens it to the wood: all this is the preparation.

Now he comes to casting; in the performance of which, placing the under half of the mould in his left hand, with the hook or hag forward, he clutches the ends of its wood between the lower part of the ball of his thumb and his three hind fingers; then he lays the upper half of the mould upon the under half, so that the male gages may fall into the female gages, and at the same time the foot of the matrice places itself upon the stool; and, clasping his left-hand thumb strong over the upper half of the mould, he nimbly catches hold of the bow or spring with his right-hand fingers at the top of it, and his thumb under it, and places the point of it against the middle of the notch in the backside of the matrice, pressing it as well forwards towards the mould, as downwards by the shoulder of the notch close upon the stool, while at the same time with his hinder fingers, as aforesaid, he draws the under half of the mould towards the ball of his thumb, and thrusts by the ball of his thumb the upper part towards his fingers, that both the registers of the mould may press against both sides of the matrice, and his thumb and fingers press both halves of the mould close together.

Then he takes the handle of his ladle in his right hand, and with the ball of it gives a stroke, two or three, outwards upon the surface of the melted metal, to scum or clear it from the film or dust that may swim upon it; then takes up the ladle full of metal, and having his mould, as aforesaid, in his left hand, he a little twists the left side of his body from the furnace, and brings the geat of his ladle (full of metal) to the mouth of the mould, and twists the upper part of his right hand towards him to turn the metal into it, while at the same moment of time he jilts the mould in his left hand forwards, to receive the metal with a strong shake (as it is called), not only into the body of the mould, but while the metal is yet hot running, swift and strongly, into the very face of the matrice, to receive its perfect form there, as well as in the shank.

Then he takes the upper half of the mould off the under half, by placing his right-hand thumb on the end of the wood next his left-hand thumb, and his two middle-fingers at the other end of the wood; and finding the letter and break lie in the under half of the mould (as most commonly by reason of its weight it does), he throws or tosses the letter, break and all, upon a sheet of white paper laid for that purpose on the bench, just a little beyond his left hand, and is then ready to cast another letter as before; and also, the whole numb[illegible]s to be cast with that matrice. A ordinarily cast about three thousand ers in a day.

he castels at the furnace have got a sufficient number of types upon the tables, a set of boys come and nimbly break away the jets from them: the jets are thrown into the pots, and the types are carried away in parcels to other boys, who pass them swiftly under their fingers, defended by leather, upon smooth flat stones, in order to polish their broad sides. This is a very dexterous operation, and is a remarkable instance of what may be effected by the power of habit and long practice: for these boys, in turning up the other side of the type, do it so quickly by a mere touch of the fingers of the left hand, as not to require the least perceptible intermission in the motion of the right-hand upon the stone. The types, thus finely smoothed and flattened on the broad sides, are next carried to another set of boys, who sit at a square table, two on each side, and there are ranged up on long rulers or sticks, fitted with a small projection, to hinder them from sliding off backwards. When the sticks are so filled, they are placed, two and two, upon a set of wooden pins fixed into the wall, near the dresser, sometimes to the amount of an hundred, in order to undergo the finishing operations. This workman, who is always the most expert and skilful in all the different branches carried on at the foundery, begins by taking one of these sticks, and, with a peculiar address, slides the whole column of types off upon the dressing-stick: this is made of well-seasoned mahogany, and furnished with two end-pieces of steel, a little lower than the body of the types, one of which is moveable, so as to approach the oth by means of a long screw-pin, inserted in the end of the stick. The types are put into this stick with their faces next to the back or projection; and after they are adjusted to one another so as to stand even, they are then bound up, by screwing home the moveable end-piece. It is here where the great and requisite accuracy of the moulds comes to be perceived; for in this case the whole column, so bound up, lies flat and true upon the stick, the two extreme types being quite parallel, and the whole has the appearance of one solid continuous plate of metal. The least inaccuracy in the exact parallelism of the individual type, when multiplied so many times, would render it impossible to bind them up in this manner, by disposing them to rise or spring from the stick by the smallest pressure from the screw. Now, when lying so conveniently with the narrow edges uppermost, which cannot possibly be smoothed in the manner before mentioned by the stones, the workman does this more effectually by scraping the surface of the column with a thick-edged but sharp razor, which at every stroke brings on a very fine smooth skin, like to polished silver; and thus he proceeds till in about half a minute he comes to the farther end of the stick. The other edges of the types are next turned upwards, and polished in the same manner. It is whilst th types thus lie in the dressing-stick, that the operation of bearding or barbing is performed, which is effected by running a plane, faced with steel, along the shoulder of the body next to the face, which takes more or less off the corner, as occasion may require. Whilst in the dressing-stick they are also grooved, which is a very material operation. In order to understand this, it must be remembered, that when the types are first broken off from the jets, some superfluous metal always remains, which would make them bear very unequally against the paper whilst under the printing-press, and effectually mar the impression. That all these inequalities may, therefore, be

taken away, and that the bearings of every type may be regulated by the shoulders imparted to them all alike from the mould, the workman or dresser proceeds in the following manner: The types being screwed up in the stick, as before mentioned, with the jet-end outermost, and projecting beyond the wood about one-eighth of an inch, the stick is put into an open press, so as to present the jet-end uppermost, and then every thing is made fast by driving a long wedge, which bears upon a slip of wood, which lies close to the types the whole length: then a plough or plane is applied, which is so constructed as to embrace the projecting part of the types betwixt its long sides, which are made of polished iron. When the plane is thus applied, the steel cutter bearing upon that part between the shoulders of the types, where the inequalities lie, the dresser dexterously glides it along, and by this means strips off every irregular part that comes in the way, and so makes an uniform groove the whole length, and leaves the two shoulders standing; by which means every type becomes precisely like to another, as to the height against paper. The types being now finished, the stick is taken out of the press, and the whole column replaced upon the other stick; and after the whole are so dressed, he proceeds to pick out the bad letters, previous to putting them up into pages and papers. In doing this he takes the stick into his left hand, and turning the faces near to the light, he examines them carefully; and whenever an imperfect or damaged letter occurs, he nimbly plucks it out with a sharp bodkin, which he holds in the right hand for that purpose. Those letters which, from their form, project over the body of the type, and which cannot on this account be rubbed on the stones, are scraped on the broad sides with a knife or file, and some of the metal next the face pared away with a penknife, in order to allow the type to come close to any other. This operation is called kerning.

The excellence of printing types consists not only in the due performance of all the operations above described, but also in the hardness of the metal, form and fine proportion of the character, and in the exact bearing and ranging of the letters in relation to one another.

FO'UNDLING. *s.* (from *found* or *find.*) A child exposed to chance; a child found without any parent or owner (*Sidney*).

FO'UNDRESS. *s.* (from *founder.*) 1. A woman that founds, builds, establishes, or begins any thing. 2. A woman that establishes any charitable revenue (*Dryden*).

FOUNT, or FONT, among printers, a set or quantity of letters, and all the appendages belonging thereto, as numeral characters, quadrates, points, &c. cast by a letter-founder, and sorted. Founts are large or small, according to the demand of the printer, who orders them by the hundred weight, or by sheets. When a printer orders a fount of five hundred, he means that the fount, consisting of letters, points, spaces, quadrates, &c. shall weigh 500lb. When he demands a fount of ten sheets, it is understood, that with that fount he shall be able to compose ten sheets, or twenty forms, without being obliged to distribute, that is, take them to pieces. The founder proceeds accordingly; he reckons 120*lb.* for a sheet, including the quadrates, &c. or 60lb. for a form, which is only half a sheet: not that the sheet always weighs 120lb. or the form 60lb. on the contrary, it varies according to the size of the form: besides, it is always supposed that there are letters left in the cases. As therefore every sheet does not comprehend the same number of letters, nor the same sort of letters, we must observe, that, as in every language some sounds recur more frequently than others, some letters will be in much more use, and oftener repeated than others, and consequently their cells or cases should be better stored than those of the letters which do not recur so frequently: thus, a fount does not contain an equal number of *a* and *b*, or of *b* and *c*, &c. the letter-founders have, therefore, a list or tariff, or, as the French call it, a police, by which they regulate the proportions between the different sorts of characters that compose a fount; and it is evident that this tariff will vary in different languages, but will remain the same for all sorts of characters employed in the same language. Suppose a fount of lower case to consist of 100,000 characters, which is a common fount: here the *a* should have 5,000, the *c* 3,000, the *e* 11,000, the *i* 6,000, the *m* 3,000, the *k* only 30, and the *x*, *y*, and *z* not many more. See PRINTING.

FOUNT. FO'UNTAIN. *s.* (*fons*, Latin. *fontaine*, French.) 1. A well; a spring (*Milton*). 2. A small basin of springing water (*Addison*). 3. A jet; a spout of water (*Bacon*). 4. The head or first spring of a river (*Dryden*). 5. Original; first principle; first cause (*Sprat*).

FO'UNTAIN, in philosophy, a spring or source of water rising out of the ground. See SPRING.

FO'UNTAIN, or ARTIFICIAL FOUNTAIN, in hydraulics, a machine or contrivance by which water is violently spouted or darted up; called also a jet d'eau.

There are various kinds of artificial fountains, but all formed by a pressure of one sort or another upon the water, &c. viz. either the pressure or weight of a head of water, or the pressure arising from the spring and elasticity of the air, &c. When these are formed by the pressure of a head of water, or any other fluid of the same kind with the fountain, or jet, then will this spout up nearly to the same height as that head, abating only a little for the resistance of the air, with that of the adjutage, &c. in the fluid's rushing through; but, when the fountain is produced by any other force than the pressure of a column of the same fluid with itself, it will rise to such a height as may be nearly equal to the altitude of a column of the same fluid whose pressure is equal to the given force that produces the fountain.

FOUNTAIN OF HERO OF ALEXANDRIA, so called, because it was contrived by him. In this (see Pl. 69. fig. 5.) the air being only compressed by the concealed fall of water, makes a jet, which, after some continuance, is considered by the ignorant as a perpetual motion; be-

cause they imagine that the same water which fell from the jet rises again. The boxes CE and DYX, being close, we see only the bason ABW, with a hole at W, into which the water spouting at B falls; but that water does not come up again; for it runs down through the pipe WX into the box DYX, from whence it drives out the air, through the ascending pipe YZ, into the cavity of the box CE, where, pressing upon the water that is in it, it forces it out through the spouting pipe OB, as long as there is any water in CE; so that this whole play is only whilst the water contained in CE, having spouted out, falls down through the pipe WX into the cavity DYX. The force of the jet is proportional to the height of the pipe WX, or of the boxes CE and DY above one another: the height of the water, measured from the bason ABW to the surface of the water in the lower box DYX, is always equal to the height measured from the top of the jet to the surface of the water in the middle cavity at CE. Now, since the surface CE is always falling, and the water in DY always rising, the height of the jet must continually decrease, till it is shorter by the height of the depth of the cavity CE, which is emptying, added to the depth of the cavity DY, which is always filling; and when the jet is fallen so low, it immediately ceases. The air is represented by the points in this figure. To prepare this fountain for playing, which should be done unobserved, pour in water at W, till the cavity DXY is filled; then invert the fountain, and the water will run from the cavity DXY into the cavity CE, which may be known to be full, when the water runs out at B held down. Set the fountain up again, and, in order to make it play, pour in about a pint of water into the bason ABW; and, as soon as it has filled the pipe WX, it will begin to play, and continue as long as there is any water in CE. You may then pour back the water left in the bason ABW, into any vessel, and invert the fountain, which, being set upright again, will be made to play, by putting back the water poured out into ABW; and so on as often as you please.

Fountain, with regard to architecture, is an assemblage of masonry, sculpture, &c. connected with an hydraulic fountain, either for convenience or decoration: these acquire various denominations, according to their form and situation, as pyramidal fountain, bason fountain, rustic fountain, covered fountain, &c.

Fountain pen. See Pen.

FO'UNTAINLESS. *a.* (from *fountain.*) Having no fountain; wanting a spring (*Milt*).

FO'UNTFUL. *a.* (*fount* and *full.*) Full of springs (*Chapman*).

To FOUPE. *v. a.* To drive with sudden impetuosity: out of use (*Camden*).

FOUQUIERES (James), a Flemish painter, born at Antwerp in 1580. He was the disciple of Velvet Breughel, and became so excellent in painting landscape as to be ranked with Titian. He died in 1659.

FOUR. *a.* (feopep, Saxon.) Twice two.

Four-cleft leaf. In botany, quadrifid. Folium quadrifidum. See Cleft.

Four-cornered stem or peduncle. As in verticillate plants. A four-cornered silique, as in sinapis nigra.

Four corners, in the manage, or to work upon four corners, is to imagine the colt to be divided into four quarters, so that upon each of them the horse may make a round or two in a trot or gallop; which being done he has made the four corners.

Four-fold leaves. Folia quaterna. In botany, quaternate; four together, or by fours, at each joint or whorl; as in sherardia fruticosa, asperula taurina, cynanchica, &c. several of the galiums, erica herbacea, &c.

Four-leaved tendril. Cirrus tetraphyllus. A tetraphyllous tendril; four leaves to each tendril; as in lathyrus sativus.

Four-lobed leaf. Folium quadrilobatum. In botany, quadrilobate. See Lobatum.

Four-parted leaf. Folium quadripartitum. In botany, quadripartite. See Parted.

FOURBE. *s.* (French.) A cheat; a tricking fellow: not in use (*Denham*).

FOURFO'LD. *a.* (*four* and *fold.*) Four times told (*Samuel*).

FOURFO'OTED. *a.* (*four* and *foot.*) Quadruped; having four feet (*Dryden*).

FOURSCO'RE. *a.* (*four* and *score.*) Four times twenty; eighty (*Sandys*).

FOURSQUA'RE. *a.* (*four* and *square.*) Quadrangular (*Raleigh*).

FOURTE'EN. *a.* (feopentyn, Sax.) Four and ten; twice seven.

FOURTE'ENTH. *a.* (from *fourteen.*) The ordinal of fourteen; the fourth after the tenth.

Fourteenth, in music, the octave of the seventh.

FOURTH, or Perfect fourth, a musical interval, comprising two tones and a semitone. Its extremes are two sounds in the ratio of 4 : 3. The ancients reckoned this interval as a principal concord: but some, though not a majority, of the moderns, think it cannot be ranked among the concords at all.

Fourth (Imperfect), contains four semitones, as from G sharp to C natural.

Fourth (Redundant), is a discord composed of the ratios of 27 : 20, and of 4 : 5.

FO'URTHLY. *ad.* In the fourth place (*Bacon*).

FOURWHE'ELED. *a.* (*four* and *wheel.*) Running upon four wheels (*Pope*).

FO'UTRA. *s.* (from *foutre*, French.) A fig; a scoff (*Shakspeare*).

FOWEY, a borough and seaport in Cornwall, with a market on Saturdays, and a considerable share in the pilchard fishery. It is seated at the mouth of the river Fowey, and sends two members to parliament. Lat. 50. 19 N. Lon. 4. 35 W.

FOWL. *s.* (fugel, fuhl, Saxon.) A winged animal; a bird. *Fowl* is used collectively: as, we dined upon fish and *fowl* (*Bacon*).

To FOWL. *v. n.* To kill birds for food or game.

FOWLER. *s.* (from *fowl.*) A sportsman who pursues birds (*Philips. Pope*).

FOWLER (Edward), an English prelate, was *born at Westerleigh in Gloucestershire, in 1632, and educated at Corpus Christi college,* Oxford. At the restoration he scrupled conformity, having been bred wholly among the puritans; but at length he complied, and in 1673 he was presented to the rectory of Allhallows, Bread-street. In 1675 he was made prebendary of Gloucester, and in 1681 vicar of St. Giles's, Cripplegate. The same year he took his doctor's degree. He was a very active promoter of the revolution, for which he was promoted to the see of Gloucester in 1691. He died at Chelsea in 1714. He published several religious books; the best known of which is that intituled, The Design of Christianity; or a plain Demonstration and Improvment of this Proposition, viz. that the enduing man with inward real righteousness and true holiness was the ultimate end of our Saviour's coming into the world, and is the great intendment of his blessed gospel, 8vo. This excellent book has been frequently printed, and deserves a serious perusal.

FOWLING: a sporting term applied in different counties, and by different sportsmen, to different pursuits. It is equally applicable to land or water birds of certain descriptions, or to the apparatus of net or gun; or to enticement or decoy by pipe, whistle, or call.

Water fowls are naturally the most subtil and cunning of birds, and most careful of their own safety; whence they have, by some authors, been compared to an orderly and well governed camp, having scouts on land afar off, courts of guards, centinels, and all kinds of other watchful officers, surrounding the body, to give an alarm upon the approach of any seeming danger.

And in fact, you will always find that there are some straggling fowls which lie aloof from the greater number, which will call first.

Now it is the nature of water fowl to fly in great flocks, having always a regard to the general safety; so that if you see a single fowl or a couple fly together, you may imagine they have been affrighted from the rest by some sudden disturbance, or apprehension of danger; but so naturally are they inclined to society, that they seldom leave wing till they meet together again.

And this is occasioned not only by the near approach of man, but also by the beating of haggards upon the rivers, as well as by the appearance of the bold buzzard and ring-tail.

Of water-fowls there are two kinds, the one such as live off the water, or on it but without swimming in it; wading, and diving alone with their long legs, constituting the grallæ order: the other, the web-footed that are peculiarly formed for swimming, as the swan, goose, mallard, and indeed all the anseres tribe.

As to the manner of fowling, or taking fowls, see the articles under each particular kind in their proper places. See also SHOOTING.

FOWLING-PIECE, a gun for shooting game of all kinds, whether of course or feather.

On the perfect construction of this depends, in *a great degree, the success and even the safety of the sportsman. We shall therefore enter at some* length into its form and requisites, whatever be the sport for which it is immediately designed.

Of the manufacture and perfection of a fowling-piece.—To form a gun-barrel in the manner generally practised for those denominated common, the workmen begin by heating and hammering out a bar of iron into the form of a flat ruler, thinner at the end intended for the muzzle, and thicker at that for the breech; the length, breadth, and thickness, of the whole plate, being regulated by the intended length, diameter, and weight of the barrel. This oblong plate of metal is then, by repeated heating and hammering, turned round a cylindrical rod of tempered iron, called a mandril, whose diameter is considerably less than the intended bore of the barrel. The edges of the plate are made to overlap each other about half an inch, and are welded together by heating the tube in lengths of two or three inches at a time, and hammering it, with very brisk but moderate strokes, upon an anvil which has a number of semicircular furrows in it, adapted to the various sizes of barrels. The heat required for welding is, the bright white heat, which immediately precedes fusion, and at which the particles of the metal unite and blend so intimately with each other, that, when properly managed, not a trace is left of their former separation: this degree of heat is generally known by a number of brilliant sparks flying off from the iron whilst in the fire; although it requires much practice and experience to ascertain the degree of heat required for welding iron, which possesses various qualities, and is seldom alike. Every time the barrel is withdrawn from the forge, the workman strikes the end of it once or twice gently against the anvil in a horizontal direction: this operation, which the English artists term jumping, the French, *estoquer*, serves to consolidate the particles of the metal more perfectly, and to obliterate any appearance of a seam in the barrel. The mandril is then introduced into the bore or cavity; and the barrel, being placed in one of the furrows or moulds of the anvil, is hammered very briskly by two persons besides the forger, who all the time keeps turning the barrel round in the mould, so that every point of the heated portion may come equally under the action of the hammers. These heatings and hammerings are repeated until the whole of the barrel has undergone the same operation, and all its parts are rendered as perfectly continuous as if it had been bored out of a solid piece.

The imperfections to which a gun-barrel is liable in forging are of three kinds, viz. the chink, the crack, and the flaw. The chink is a solution of continuity, running lengthwise of the barrel. The crack is a solution of continuity, more irregular in its form than the chink, and running in a transverse direction, or across the barrel. The flaw differs from both: it is a small plate or scale, which adheres to the barrel by a narrow base, from which it spreads out as the head of a nail does from its shank; and, when separated, leaves a pit or hollow in the metal.

With regard to the soundness of the barrel, the

chink and flaw are of much greater importance than the crack, as the effort of the powder is exerted upon the circumference, and not upon the length of the barrel. In a sword or bow, the very reverse of this takes place; for if a crack, though but of a slight depth, occur in either, it will break at that place when bent but a very little; because the effort is made upon the fibres disposed longitudinally; whereas, if the fault be a chink, or even a slight flaw, the sword or bow will not give way. The flaw is much more frequent than the chink; the latter scarcely ever occurring but in barrels forged as above, in which the fibres of the metal run longitudinally; and then only when the iron is of an inferior quality. When external and superficial, they are all defects in point of neatness only; but, when situated within the barrel, they are of a material disadvantage, by affording a lodgment to moisture and foulness that corrode the iron, and thus continually enlarge the excavation until the barrel bursts, or becomes dangerous to use.

The barrel, when forged, is either finished in the common manner, or made to undergo the operation of twisting, which is a process employed on those barrels that are intended to be of a superior quality and price to others. This operation consists in heating the barrel, in portions of a few inches at a time, to a high degree of red heat; when one end of it is screwed into a vice, and into the other is introduced a square piece of iron with a handle like an augur; and, by means of these, the fibres of the heated portion are twisted in a spiral direction, that is found to resist the effort of the powder much better than a longitudinal one.

To persons unacquainted with the loss which iron suffers in forging, it will be a matter of surprise that 12 pounds of iron are required to produce a barrel, which, when finished, shall not weigh more than two pounds and a half. But, although a considerable waste is unavoidable, yet the quantity of it depends very much upon the quality of the iron, upon that of the coal, and upon the knowledge and dexterity of the workmen. In Spain they cannot work but with charcoal; in France they employ pit-coal charred, or coke; in England they use pit-coal without being charred, but are very careful to have it of the purest kind, some sorts containing a portion of sulphur and arsenic which render the metal altogether unmalleable, or, in the language of the workmen, poison the iron.

A circumstance of considerable importance to the excellence of a barrel is, the forging it as near as can be to the weight it is intended to be of when finished, so that very little be taken away in the boring and filing; for, as the outer surface, by having undergone the action of the hammer more immediately than any other part, is rendered the most compact and pure, we should be careful to remove as little of it as possible: the same thing holds, though in a less degree, with regard to that portion of the inside of the barrel which is to be cut out by the boring instrument.

Pistol barrels are forged in one piece, and are cut asunder at the muzzles after they have been bored; by which there is not only a saving of iron and of labour, but a certainty of the caliber being perfectly the same in both.

The next operation consists in giving to the barrel its proper caliber: this is termed boring. The boring-bit is a rod of iron, somewhat longer than the barrel; one end being made to fit the socket of the crank, and the other being furnished with a cylindrical plug of tempered steel, about an inch and a half in length, and having its surface cut in the manner of a perpetual screw, the threads being flat, about a quarter of an inch in breadth, and running with very little obliquity. This form gives the bit a very strong hold of the metal; and the threads, being sharp at the edges, scoop out and remove every roughness and inequality from the inside of the barrel, and render the cavity smooth and equal throughout. A number of bits, each a little larger than the preceding one, are afterwards successively passed through the barrel in the same way, until it has acquired the intended caliber. The equality of the bore is so essential to the excellence of a piece, that the greatest accuracy in every other particular will not compensate for the want of it. Any person who wishes to know the merit of his piece in this respect, may do it with tolerable accuracy, by means of a plug of lead, cast on a rod of iron or wood; or even by a musket ball, filed so as to fit the bore exactly, and pushed through the barrel by the ram-rod, care being taken not to use an iron ram-rod, or much force, lest the ball be flattened, and an artificial difficulty created.

The barrel may be now considered as quite finished with regard to its inside: at least it has nothing more to be done to it by the maker. The gunsmiths, however, generally make it undergo a further operation of polishing; after which it is in a condition to receive its proper form and proportions externally, by means of the file. To do this with accuracy, four flat sides or faces are first formed: then eight, then sixteen, and so on, until it is made quite round; except the reinforced part, which in most of the modern work is left with eight sides. This octagonal form of the reinforced part is certainly more elegant than the round one formerly in use: but it adds to the weight of the barrel without increasing its strength; for the effort of the powder will always be sustained by the thinnest part of the circumference, without any regard to those places that are thicker than the rest.

It is absolutely necessary to the soundness of a barrel, that it should be of an equal thickness on every side; or, in the language of the workmen, a barrel ought to be perfectly upright. In order to arrive, as nearly as possible, to this perfect equality, the gunsmiths employ an instrument which they call a compass. It consists of an iron rod bent so as to form two parallel branches about an inch distant from each other. One of these branches is introduced into the barrel, and kept closely applied to the side by means of one or more springs with which it is furnished: the other branch descends parallel to this, on the outside, and has several screws passing through it with their points directed to the barrel. By screwing these until their points touch the surface of the barrel, and then turning the instrument round within the bore, it is seen where the metal is too thick, and how much it must be reduced in order to render every part of the barrel perfectly equal throughout its circumference. To form the screw in the breech-end of the barrel, the first tool employed is a plug of tempered steel, somewhat conical, and having upon its surface the threads of a male screw. This tool, which is termed a screw-tap, being introduced into the barrel, it is turned from left to right, and back

again, until it has marked out the three or four first threads of the screw: another less conical tap is then introduced; and when this has carried on the impression of the screw as far as it is intended to go, a third tap is employed, which is nearly cylindrical, and scarcely differs from the plug of the breech which is intended to fill the screw thus formed in the barrel. The breech-plug has its screw formed by means of a screw-plate made of tempered steel, and has several female screws corresponding with the taps employed to form that in the barrel. A plug of seven or eight threads is sufficiently long; and the threads ought to be neat and sharp, so as to fill completely the turns made in the barrel by the tap. The breech-plug is afterwards case-hardened, or has its surface converted into steel, by being covered over with shavings of horn, or pairings of horse-hoof, and kept red-hot in the fire for some time, after which it is plunged into water.

The last operation is that of colouring the barrel, previous to which it is polished with fine emery and oil, until it presents to the eye, throughout its whole length, and in whatever direction we observe it, a perfectly smooth, equal, and splendid surface. Formerly barrels were coloured by exposing them to a degree of heat which produced an elegant blue tinge; but, as this effect arises from a degree of calcination taking place upon the surface of the metal, the inside of the barrel always suffered by undergoing the same change. This, therefore, added to the painful sensation excited in the eye by looking along a barrel so coloured, has caused the practice of blueing to be disused for some time past. Instead of it, barrels are now browned, as it is termed. To do this, the barrel is rubbed over with aquafortis, or spirits of salt, diluted with water, and laid by until a complete coat of rust is formed upon it; a little oil is then applied; and the surface, being rubbed dry, is polished by means of a hard brush and bees-wax.

When the barrels intended for a double-barrelled piece are dressed to their proper thickness, which is generally less than for single barrels, each of them is filed flat on the side where it is to join the other, so that they may fit close together. Two corresponding notches are then made at the muzzle and breech of each barrel; and into these are fitted two small pieces of iron, to hold them more strongly together. The barrels being united by tinning the parts where they touch, the ribs are fitted in, and made fast by the same means. These ribs are the triangular pieces of iron which are placed between the barrels, running on the upper and under sides their whole length, and serving to hold them more firmly together. The under rib is a late improvement, and is found more effectually to prevent the barrels from warping. When the barrels are thus joined, they are polished and coloured in the manner already described.

The twisted barrels are deservedly celebrated for their superior elegance and strength, as well as for the accuracy with which they throw either ball or shot. The iron employed in them is formed of stubs, which are old horse-shoe nails procured from country farriers, and from poor people who gain a subsistence by picking them up on the great roads leading to the metropolis. These are originally formed from the softest and toughest iron that can be had; and this is still farther purified by the numerous heatings and hammerings it has undergone in being reduced from a bar into the size and form of nails. They cost about ten shillings the hundred weight, and twenty-eight pounds are required to make a single barrel of the ordinary size. A hoop of iron, about an inch broad, and six or seven inches diameter, is placed perpendicularly; and the stubs, previously freed from dirt by washing, are neatly piled in it, with their heads outermost on each side, until the hoop is quite filled and wedged tight with them; the whole resembling a rough circular cake of iron. This is put into the fire until it has acquired a white heat; when it is hammered, either by the strength of the arm, or by the force of machinery, until it coalesces, and becomes one solid mass of iron: the hoop is then removed, and the heatings and hammerings repeated, until the iron, by being thus wrought and kneaded, is freed from every impurity, and rendered very tough and close in the grain: the workman then proceeds to draw it out into pieces of about twenty-four inches in length, half an inch or more in breadth, and half an inch in thickness.

These pieces, however, are not all of the same thickness, some being more and others less than what we have mentioned, according to the proposed thickness of the barrel, and that part of it which the piece is intended to form. One of these pieces, being heated red-hot for five or six inches, is turned like a corkscrew, without any other tools than the anvil and hammer. The remaining portions are successively treated in the same manner, until the whole piece is turned into a spiral, forming a tube whose diameter corresponds with that of the intended barrel. Four of these are generally sufficient to form a barrel of the ordinary length, which is from thirty-two to thirty-eight inches; and the two which form the breech, or reinforced part, are considerably thicker than those which constitute the fore-part, or muzzle of the barrel. The workman first welds one of these tubes to a part of an old barrel, which serves as a handle. He then proceeds to unite the turns of the spiral to each other, by heating the tube two or three inches at a time, to a bright white heat, and striking the end of it several times against the anvil in a horizontal direction, and with considerable force: this is termed jumping the barrel; and the heats given for the purpose are called jumping heats. A mandril is then introduced into the cavity; and the heated portion is hammered lightly, to flatten the ridges or burs raised by the jumping at the place where the spirals are joined. As soon as one piece is jumped its whole length, another is welded to it, and treated in the same manner, until the four pieces are united; when the part of the old barrel, being no longer necessary, is cut off. The welding the turns of the spiral is performed exactly in the same manner as before described, and is repeated three times. The barrel is afterwards finished in the same way as a common one. Stub-iron is also wrought into plain barrels; which, as they require a great deal less labour, are only half the price of the twisted ones.

The *canons à rubans*, or *ribbon-barrels*, of the French, very much resemble the English twisted barrels. The process pursued in their formation is considerably more operose than that just described, but seems to be far from possessing any advantage over it. The acknowledged superiority of twisted and ribbon barrels over plain ones has induced some persons to counterfeit them, by colouring plain barrels so as to shew a spiral line running from one end to the other. This is done by winding a thread or string in a spiral direction

round a plain barrel, and then wetting the string with the diluted aqua-fortis, or spirit of salt, so that a coat of rust may be formed where the string touches: when the acid is applied the second time over the whole barrel, the part over which the string was applied, by being more rusted than the rest, shows a dark line winding round the barrel, and renders it, when finished, scarcely distinguishable from a twisted or ribbon-barrel. Other barrels are, by the same means, clouded in an irregular manner, so as to resemble those formed of stub-iron. To prove whether or not a barrel is really what it appears to be, we need only fix upon any part on the under side that is covered by the stock, and having cleared it, if necessary, with a fine file, apply a feather dipped in aqua-fortis, which in a little time will render the fibres of the metal distinctly visible, in whatever direction they run.

The Spanish barrels have always been held in great esteem, as well on account of the quality of the iron, which is generally considered as the best in Europe, as because they possess the reputation of being forged and bored more perfectly than any others. It should be observed, however, that of the Spanish barrels, those only that are made in the capital are accounted truly valuable; in consequence of which a great many have been made at other places, especially at Catalonia, in Biscay, with the names and marks of the Madrid gunsmiths; they are also counterfeited at Liege, Prague, Munich, &c. and a person must be a very good judge not to be deceived by these spurious barrels.

Proofs of barrels.—These differ in different countries. The Spanish proof is a very severe one; but, as it is made before the barrel is filed, it is not satisfactory. At the royal manufactories of St. Etienne and Charleville, in France, there were inspectors appointed to see that no barrels were sent out of these places, whether for the king's use or for public sale, without being proved. The first proof was made with a ball exactly fitting the caliber, and an ounce of powder. The second was made with the same sized ball and half an ounce of powder. The reason given for the second proof is, that the first may h strained the barrel so much, though the injury be not visible, that it will not bear a second trial with a smaller charge; and it is said there really are some of these barrels which stand the first proof, and yet give way in the second.

The usual proof of the Paris barrels is a double charge of powder and shot; that is, two or two and a half drams of powder, and two or two and a half ounces of shot. The English Tower proof, and that of the Whitechapel company, incorporated by charter for proving of arms, are made with a ball of the caliber and a charge of powder equal in weight to this ball: the proof is the same for every size and species of barrel, and not repeated.

Some gunsmiths pique themselves upon making their barrels undergo a second proof; but it is proper to observe, that if a barrel bears any assigned proof, it will sustain the same immediately after, with greater safety than it did at first, as the metal, from being warmed by the first fire, expands more readily to the force of the second explosion.

Mons. de Marolles, speaking of the proofs of barrels, says, "A stronger proof than ordinary might be made by ramming down at top of the powder six or seven inches of dry clay, in place of [illegible] charge of lead. This is sometimes employed in proving pieces of ordnance, where, instead of the bullet, two feet of clay is placed over the powder, by which the whole force of the explosion is exerted upon the piece." We entirely agree with the ingenious author of La Chasse au Fusil, in the opinion that the proof he mentions would be much stronger than that which is usually employed; so much stronger, indeed, that we do not believe any barrel could withstand it, unless the clay were put down in the loosest manner possible. The hardest rocks are burst asunder by means of dry clay strongly rammed over the powder that is placed at the bottom of a cylindrical cavity made in them; and we certainly cannot expect that a force sufficient to rend in pieces immense blocks of granite can be resisted by the comparative trifling strength and thickness of a gun-barrel.

Causes of bursting.—It may be safely asserted, that a good barrel very seldom bursts, unless it be charged too highly, or in an improper manner. Whenever, for example, from the ball not being rammed home, a space is left between it and the powder, there is a great risk of the barrel bursting on being discharged. We say a great risk, because, even under these circumstances, it frequently happens that the barrel does not burst. If the ball stops near to the powder, a very small windage is sufficient to prevent this accident; and it is very rare that the ball touches the barrel in every part of its circumference, unless it has been driven in by force with an iron ram-rod; in which case it moulds itself to the cavity, and blocks it up completely. Should this happen, the barrel, however strong it is, will burst, even when the space between the ball and the powder is but very inconsiderable; and the greater the space that intervenes, the more certainly will this event take place. Mr. Robins, when speaking of this matter, says, "A moderate charge of powder, when it has expanded itself through the vacant space and reaches the ball, will, by the velocity each part has acquired, accumulate itself behind the ball, and will thereby be condensed prodigiously; whence, if the barrel be not of an extraordinary strength in that part, it must infallibly burst. The truth of this I have experienced in a very good Tower musquet, forged of very tough iron; for, charging it with twelve pennyweights of powder, and placing the ball (loosely) sixteen inches from the breech; on the firing of it, the part of the barrel just behind the bullet was swelled out to double its diameter, like a blown bladder, and two large pieces of two inches long were blown out of it."

The same accident will often take place from the mouth of the piece being filled with earth or snow, as sometimes happens when we are leaping a ditch, with the muzzle of the piece pointed forwards; and if in such cases the barrel do not burst, it is because these foreign bodies stop it up but very loosely. For the same reason, a barrel will certainly burst, if fired when the muzzle is thrust into water but a very little depth below the surface; the resistance given to the passage of the inflamed powder through the mouth of the piece being, in this case, much greater than that afforded by the sides of the barrel. Except in the circumstances mentioned, or in case of an overcharge, it is very rare that a barrel bursts. Whenever it happens independent of these, it is from a defect in the work, and that either the barrel has been imperfectly welded, or that a deep flaw has taken place in some part of it; or, lastly, that through want of care in the boring or filing, it is

left of unequal thickness in its sides. The last defect is the most common, especially in low-priced barrels; and, as pieces more frequently burst from it than from the other defects, it ought to be particularly guarded against. The elastic fluid which is set loose by the inflammation of the powder, and which endeavours to expand itself equally in every direction, being repelled by the stronger parts, acts with additional force against the weaker ones, and frequently bursts its way through them; which would not have been the case, had the sides been of the same thickness and strength, and not afforded an unequal repercussion. The weakness of any part of the barrel, occasioned by the inequality of the caliber, will still more certainly be the cause of bursting than that produced by the filing; because the inflamed fluid being suddenly expanded at the wider part, must suffer a compression before it can pass onward, and the whole force is then exerted against the weak place; for gunpowder acts in the radii of a circle, and exerts the same force on every part of the circumference of the circle.

The conclusion to be drawn from all this is, that a thin and light barrel, which is perfectly upright, that is, of equal thickness in every part of its circumference, is much less liable to burst than one which is considerably thicker and heavier, but which, from being badly filed or bored, is left of unequal strength in its sides.

In all that we have hitherto said upon the causes of bursting, the bad quality of the iron has not been taken into account: and we do not know any means of guarding against these defects, whether arising from the badness of metal, or the insufficiency of workmanship, except by purchasing from a gunsmith of established reputation, and giving a good price for the piece. But by this we do not mean to sanction the practice of many of the gunsmiths in the fashion of the day; we are confident in our opinion, that most of their barrels are made too thin; and it may fairly be doubted, whether they have at all improved the quality of the metal. In some experiments made with a barrel of the celebrated Lazaro Cominazzo, and which was five feet ten inches in length, and extremely thin, particularly towards the muzzle, it was observed, that the barrel vibrated so much after the explosion of this charge, as to produce a whizzing or ringing sound that might be heard to a considerable distance from the barrel. And yet this piece, notwithstanding its extreme thinness, was fired with very high charges. The iron appeared to be of an extraordinary fine quality; which goes to prove that the cohesion of the particless of the metal is the force which resists that of the powder; and hence great advantage might be drawn to the manufacture of barrels, from an accurate knowledge of the force of powder, and the velocity of the ball. For, these points being once determined, it might be known how strong the barrel should be; by which all unnecessary waste of metal might be spared on the one hand, and all danger avoided on the other. For a force equal to that which impels the ball is exerted on the inside of the piece; and if the barrel has not sufficient strength to resist this force, it must of necessity burst.

Of the recoil.—The most frequent cause of excess in the recoil is the bore of the piece being wider at one place than another; for although this inequality be so small as to be imperceptible to the eye, the repulse which the expanding flame meets with when passing from the wider to the narrower part, renders the recoil much greater than it would have been had the bore been perfectly cylindrical. It is an invariable law in mechanics, that action and re-action are equal; it follows, therefore, that, the weight of the piece being the same, the recoil will be in proportion to the weight of the piece; or, the lighter the piece, the greater the recoil.

In plainer language, the impelling force of the gunpowder is the first and most simple cause of the fire-arms recoiling; for this force acts equally on the breech of the piece and on the ball: so that, if the piece and ball were of equal weight, and other circumstances the same, the piece would recoil with the same velocity as that with which the ball issues out of the piece.

For the same reason, whatever retards the exit of the charge operates like an increase of lead, and by confining the force of the explosion the more to the barrel, produces a greater recoil: hence partly it is, that in proportion as the barrel becomes foul within by repeated firing, the recoil increases. A piece will recoil, if, from the breech-plug being made too short, there remain some turns of the screw not filled up, these hollows, wherein a part of the powder is lodged, forming an obstacle that confines and retards the explosion. A barrel mounted on a stock that is very straight will recoil more than when mounted on a stock that is considerably bent, as the curvature seems to break and deaden the force of the recoil; and sometimes also a fowling-piece will recoil from the shooter applying it improperly to his shoulder; for it the but is not applied closely to the shoulder, or is applied so as to be supported only at a single point, the recoil will be much more sensibly felt than when the hollow of the but embraces the shoulder, and is firmly supported by the weight of the body. Guns are observed to recoil more after being fired a number of times than they did at the beginning. The matter which is left upon the inside of the barrel after the explosion, and which increases on every discharge, attracts moisture very quickly; especially if the saltpetre employed in the powder was not well purified from the admixtures of common salt, which it contains in its rough state. This moisture becomes considerable after a few discharges, and, being formed into vapour by the heat during the explosion, adds its expansive effort to that of the inflamed powder, and greatly increases the agitation and recoil. Owing to this cause, probably, rather than to that before-mentioned, arises the recoil from some turns of the breech-screw not being filled up by the breech-plug, and thereby affording a lodgment to moisture.

Among the variety of causes to which the excessive recoil of pieces has been attributed, there is one which yet remains to be considered; this is, the touch-hole's being placed at some distance from the breech-plug, so that the powder, instead of being fired at its base, is fired near the centre of its charge; whence, it is said, the recoil is increased, and the force of the discharge weakened, by the effort of the powder being exerted more upon the breech than upon the ball or shot. With this idea in view, some gunsmiths form a channel or groove in the breech-plug, as deep as the second or third turn of the screw; the touch-hole opens into this channel, and the powder is therefore fired at its very lowest part; and this, they assert, increases the inflammation and the force of the powder. That the distance of the touch-hole from the breech, however, has vary

little if any share in the increase of the recoil, we shall prove in the most satisfactory manner, from experiments made purposely to determine this matter. As to the idea that the force of the discharge is diminished by the increase of the recoil, it is too absurd to require discussion: the force exerted by the powder upon the breech is always equal to that which it exerts upon the ball or shot; so that, if there be nothing in the barrel that retards the exit of the ball, an increase in the recoil will be always attended with an increase in the force of the discharge.

The following experiments were made by Mons. Le Clerc, who was gunsmith to the late king of France, and well informed upon every subject that relates to his profession; they were communicated by him to Mons. De Marolles.

These experiments were made with a barrel which was thirty French inches in length, (nearly thirty-two English measure,) and weighed, together with the loaded plank upon which it was fixed, twenty-eight pounds. The barrel had four touch-holes which could be stopped with screws. The charge consisted of one drachm and twelve grains of powder from a royal manufactory, and of one ounce eighteen grains of shot called small 4. This was fired at a sheet of paper measuring twenty inches by sixteen, French measure, placed at the distance of twenty-eight toises, or nearly forty-five ordinary paces. The only difference was, that in the first set of experiments the wadding consisted of card-paper, and in the second, of hat, both cut to fit the caliber.

Had these trials been made with no other view than to determine the degree of recoil produced by the different situation of the touch-hole, there would have been no use in marking the size of the shot, the distance and dimensions of the mark, and the number of grains thrown into it at each discharge. It was, however, intended to try, at the same time, how far the equality of the discharges could be depended upon, with regard to the number of grains that struck a given space; and we shall have occasion hereafter to make remarks upon the result of the trials in this respect.

N. B. The French foot is three quarters of an inch longer than the English foot, and the French inch is divided into twelve lines.

We have thought it better to inform the reader of this, and leave the table as it is, than to make any fractions in the numbers by reducing it to English measure.

First set.—WADDING OF CARD-PAPER.

	Discharge.	Recoil.				No. of grains thrown into the mark.		
		Foot.	Inch.	Lines.	Mean.		Mean.	
Touch-hole close to the breech-plug.	1	1	0	3	0 11 $6\frac{2}{3}$	36	27	Mean of all, 28.
	2	0	10	3		14		
	3	1	0	3		31		
Touch-hole two lines from the breech-plug.	1	1	3	9	1 3 0	44	34	
	2	1	2	0		33		
	3	1	3	3		26		
Touch-hole six lines distant.	1	1	0	10	1 0 6	38	25	
	2	0	11	11		20		
	3	1	0	9		18		
Touch-hole 12 lines distant.	1	1	1	7	1 1 $0\frac{2}{3}$	27	26	
	2	1	0	3		17		
	3	1	1	4		35		

Extremes 0. 10. 3. and 1. 3. 3 —Mean recoil 1. 1. 0.
Extremes 14 and 45.

Second set.—WADDING OF HAT.

Touch-hole close to the breech-plug.	1	1	1	1	1 1 $4\frac{1}{3}$	40	51	Mean, 45.
	2	1	4	0		78		
	3	1	2	0		37		
Touch-hole two lines distant.	1	1	0	7	1 2 $0\frac{1}{3}$	44	41	
	2	1	2	3		40		
	3	1	3	3		41		
Touch-hole six lines distant.	1	1	3	8	1 3 1	32	45	
	2	1	2	9		50		
	3	1	3	2		53		
Touch-hole 12 lines distant.	1	1	4	5	1 3 $1\frac{1}{3}$	60	44	
	2	1	2	7		21		
	3	1	2	5		51		

Extremes 1. 0. 7. and 1. 4 5.—Mean recoil 1. 2. $8\frac{1}{2}$.
Extremes 21 and 73.

From these experiments it appears, that, with regard to the recoil, the distance of the touch-hole from the breech is of little importance. The only circumstance, therefore, to be attended to in its situation, is, that it be not placed quite close to the breech-plug; for, although that part of the barrel where the powder is lodged, dirties much less than a few inches farther forward, yet the touch-hole, when close to the breech-plug, is found to be more frequently stopped up than when situated about a quarter of an inch from it.

Of the range of barrels.—The lightness of fowling-pieces of a moderate length, and the ease with which they are managed, are advantages so obvious, and at the same time so considerable, as to give them a general preference at this time; but, as the circumstances upon which only this preference ought to be rested are little known, it is not sufficient that their use is general, and daily increasing, unless it be determined what are the comparative excellencies and defects of long and short barrels, and it be thence shewn whether sportsmen sacrifice one advantage to gain another.

The generally-received opinion upon this subject is, that to obtain an increase in the range, the barrel must not only be made longer than usual, but that the length and the diameter of the bore ought to bear a certain proportion to each other, and the charge of powder be suited to this proportion; because, as it is said, when the barrel is too short, the ball of shot quits it before it has received the whole impulse of the powder; and, on the other hand, when the barrel is too long, that the powder is not only all inflamed, but even partly consumed, before the ball or shot arrives at the mouth of the piece.

The elastic fluid produced by the firing of gunpowder is found, by experiment, to occupy, when cooled to the temperature of the atmosphere, a space two hundred and forty-four times greater than that taken up by the powder from which it was obtained. But from the heat generated during the explosion, this elastic fluid is rarefied to upwards of four times its former bulk. The expansive force of this fluid, therefore, is, at the moment of inflammation, one thousand times greater than that of common air, or, which is the same, than the pressure of the atmosphere; or, supposing the powder to have occupied the space of one cubic inch, its expansive force, when fired, is equal to that which would be exerted by one thousand cubic inches of common air compressed into the space of one inch. As the velocity with which the flame of gunpowder expands when uncompressed is much greater than that with which the ball, or shot, moves forward, the flame must continue to press upon the ball, and adds to its velocity, until it quits the mouth of the piece. This pressure, however, becomes less and less, as the ball proceeds, and ceases entirely when it leaves the muzzle, in consequence of the flame being then allowed to expand itself laterally. Thus, for example, if the charge of powder takes up one inch of the barrel, and the whole length of the barrel be thirty inches, then, when the ball arrives at the muzzle of the piece, the inflamed powder (whose expansive effort is in proportion to the smallness of the space it occupies) extends through thirty times the space it did when the ball began to move, and consequently presses forward with but one-thirtieth part the force it possessed at first. Moreover, although the velocity of the bullet is continually increased by this pressure of the inflamed powder, its acceleration becomes less and less as it proceeds through the barrel; for, besides that the quantity of the pressure diminishes as the flame expands, the bullet, continuing to move faster and faster, must receive continually less and less addition of impulse from the flame pressing behind it. Hence, if two pieces of the same bore, but of different lengths, are charged with the same quantity of powder, the longer piece will, strictly speaking, communicate the greater velocity and force to its ball, or shot. But as the inflammation of the powder has been shown to be nearly instantaneous, and as the increase of acceleration, which the ball or shot receives after the first impulse of the powder upon it, is not very considerable, it follows that the force with which two barrels of the same bore, and with the same charge, throw the ball or shot, will be nearly the same, unless their lengths be extremely disproportionate.

To prove this, we shall quote what is said by that able mathematician and engineer, the late Mr. Benjamin Robins, to whose work we are indebted for much valuable information. "If a musket barrel, of the common length and bore, be fired with a leaden bullet and half its weight of powder, and if the same barrel be afterwards shortened one half, and fired with the same charge, the velocity of the bullet in this shortened barrel will be about one-sixth less than what it was when the barrel was entire; and if, instead of shortening the barrel, it be increased to twice its usual length (when it will be near eight feet long) the velocity of the bullet will not hereby be augmented more than one eighth part. And the greater the length of the barrel is in proportion to the diameter of the bullet, and the smaller the quantity of powder, the more inconsiderable will these alterations of velocity be."

When the allowance which Mr. Robins here takes notice of are made in the proportion required for fowling-pieces, the result will be found to correspond exactly with the experiments which we have repeatedly made, with every possible attention to accuracy. We have, at different times, compared barrels of all the intermediate lengths between twenty-eight and forty inches, and of nearly the same caliber; and these trials were made both by firing the piece from the shoulder, and from a firm block, at an equal distance, and with equal weights of the same powder and of the same shot.

To avoid every possibility of error, the quires of paper at which we fired were fixed against planks, instead of being placed against a wall. From these trials, frequently repeated, we found that the shot pierced an equal number of sheets, whether it was fired from a barrel of 28, 30, 32, 34, 36, 38, or 40 inches in length. Nay more, we have compared two barrels of the same caliber, but one of them thirty-three and the other thirty-six inches long, by repeatedly firing them, in the same manner as the others, at different distances from forty-five to one hundred paces, and the results have always been the same, i. e. the barrel of thirty-three inches drove its shot through as many sheets of paper as that of sixty-six did. The conclusion from all this is, that the difference of ten inches in the length of the barrel, which seems to be more than is ever insisted upon among sportsmen, produces no sensible difference in the range of the piece; and therefore, that every one may please himself in the length of his barrel, without either detriment or advantage to the range.

The circumstance of a duck-gun killing at a greater distance than a fowling-piece is not owing to its length, but to its greater weight and thickness, allowing the charge of powder to be doubled, trebled, or even quadrupled; which cannot be done in a fowling-piece, though strongly reinforced. For a barrel of five or six feet, such as that of a common duck-gun, weighing five or six pounds, and the whole piece twelve or thirteen pounds, may be fired with a very large charge, without recoiling so much as to hurt the shooter, its weight being sufficient to resist the violent impulse occasioned by the increase of the powder. But in a fowling-piece of three feet barrel, sufficiently strong to withstand such a charge, and whose weight all together does not exceed five or six pounds, the recoil would be insupportable. Besides, they not only double or treble the powder in a thick gun, but they put in a much greater quantity of shot than is ever employed in a fowling-piece. Duck-guns are generally bent a little upwards near the muzzle, which the gunsmiths say makes them throw their shot farther than if they were perfectly straight. To obtain, therefore, from a piece of the ordinary length, the same effects as from a duck-gun, nothing more, perhaps, is necessary than to have the barrel sufficiently strong to admit of the charge being doubled or trebled as required, and the whole piece heavy enough to render the recoil supportable. We may here observe, however, that an increase of the powder above the charge generally used, does not produce a proportional increase of range in the ball or shot: thus a double charge of powder will not throw the ball or shot twice the distance, nor a treble charge to three times the distance the single charge does. This arises from the great resistance given by the air to the motion of the ball or shot, and which is proved to be fourfold if the velocity be doubled, and ninefold when it is trebled by an increase of powder; for the resistance of the air is not proportional to the velocity itself, but only to the square of the velocity. Thus Bernoulli, a professor in Basil, discovered from experiment, that a ball, which, being fired, ascended only seven thousand eight hundred and nineteen feet in the air, would ascend fifty-eight thousand seven hundred and fifty feet in vacuo. Still we may safely infer, that, if the action of the powder is not diminished by circumstances of defect in the formation of the barrel, the greater the force of the powder, the greater must be the velocity of the ball. So great is the change in opinion of late, with regard to the proper length for gun-barrels, that many gunsmiths will now tell us, that short barrels carry farther than long ones; and the reason they give for this is, the greater friction of the ball or shot in passing through a long barrel, by which their velocity is retarded and their force diminished. If the barrel be so long that the additional impulse which the ball or shot is continually receiving in its passage becomes less than the friction between them and the sides of the caliber, then, indeed, the barrel by being shortened will shoot with more force: but, as the length of barrel required to produce this effect is vastly greater than can ever be employed for any purpose, the objection does not hold. And it seems clear, that a piece may be made so long, that it will not throw a ball with so great a velocity as one that is considerably shorter; and the reason of this decrease of velocity may be, that in very long pieces the increase of the counter pressure of the external air in the cylinder may greatly exceed the force of the powder, and that the elastic fluid generated by the explosion of the *powder is constantly escaping whilst the ball* passes along the cylinder, which it not only does at the touch-hole, but also between the ball and the sides of the barrel; and hence may be inferred the necessity of touch-holes which do not prime of themselves, and of wadding that stops the barrel hermetically.

Having thrown every light upon this question that is necessary to determine us in our choice of the length, it will, perhaps, be expected that we give our opinion what length of barrel is best calculated for general use. The barrels which are found to answer best for every purpose, are from thirty-two to thirty-eight inches; and whether we consult the appearance of the piece, its lightness, or the ease with which it is managed, we believe that a barrel not exceeding the one, or below the other, of these numbers, is the most eligible. We know that many of the fashionable gunsmiths pique themselves on the proportion they give to the different parts of their fowling-pieces, and thence deduce a superiority over their cotemporaries in favour of their own: to us it appears that the beauty of those proportions is more attended to, than any good reason why they are made so rather than otherwise.

Of the causes of scattering shot.—From the prejudices which obtain so generally among sportsmen and gunsmiths, respecting the shot of fowling-pieces, it is very natural to suppose, that a variety of means have been sought after and practised, in order to remedy this real or pretended effect of scattering the charge. Mr. de Marolles mentions several methods employed for this purpose, none of which, however, appear to be practised in England. One of the methods he describes is as follows: An iron or wooden mandril, fitted to the caliber, is furnished at one end with small files, which are cut transversely only; this instrument being introduced into the barrel is turned round by means of a cross-handle, and forms a great number of superficial scratches in the metal, by which, they pretend, the defect of scattering the shot is remedied. One obvious effect of this operation, is, that of destroying the smoothness of the barrel within, and thereby rendering it liable to dirty the sooner; but we cannot conceive how the shot should be thrown closer by having the friction increased between it and the sides of the caliber; and that this will be the case, is evident from a rough barrel being always found leaded considerably after every discharge. Some make the barrel wider for three or four inches at the muzzle; and this bell-mouthed form is of very ancient date.

Espinar says he has generally found this succeed in making barrels throw their shot closer. Were this true, we should expect to find this form of the barrel more generally used than it is at present, and not hear so many complaints among sportsmen about their pieces.

When we consider that the grains of shot which are in actual contact with the sides of the barrel compose upwards of half the charge, we cannot be surprised if enlarging the surface of the caliber at the muzzle, and thereby increasing the number of grains that touch it, will tend to make the shot be scattered more widely. Espinar says, that the fault of scattering the shot is not owing to the hand of the workman, the barrels of the best masters being equally subject to it as those of others. He is of opinion, that it arises from the different quality of the iron composing the several portions

of the barrel. Thus he says, it may happen that the reinforced part is formed of iron which is harder, and closer in the grain, than that forming the fore part of the barrel; in consequence of which, and also from the fore part being so much thinner, the latter is the more shaken by the powder, and by that means produces a dispersion of the shot. He therefore pretends, that widening the muzzle in the manner already spoken of, by facilitating the explosion, diminishes the force of the powder upon this part, and causes the shot to be thrown more closely together.

This opinion of Espinar, however, not only appears absurd in itself, but there is not even the smallest ground for it in the greater number of instances; the barrels which are forged in separate pieces being very few indeed, compared with those that are forged in a single piece, and are consequently of the same quality throughout: nor does it appear that the former are more liable to the fault in question than the latter are.

Some gunsmiths, says Mons. de Marolles, pretend, that a barrel, in order to throw its shot closely, ought to have a caliber narrower in the middle than at either breech or muzzle; whilst others, again, insist that the caliber ought to contract gradually from the breech to the muzzle. With respect to these contrivances, however, we shall only observe, that they are both admirably calculated to make the piece recoil, if not to burst it.

Of all these contrivances, not one appears calculated to answer the end for which it was proposed. The greater number of gunsmiths are sensible of this, and therefore very seldom practise them, unless to indulge the whim of their customers. As far as our reason and experience are sufficient for enabling us to determine upon the matter, we would reject all the expedients that have been hitherto proposed, and give a decided preference to the barrels as they are usually made, i. e. to those whose caliber is very smooth and perfectly cylindrical throughout. Barrels of this kind have long supported their credit among the best sportsmen, whilst the pretended improvements have all experienced but a very temporary reputation, and are now almost entirely neglected. Would sportsmen only forbear to determine upon the merits or defects of their pieces, until they had given them a patient and impartial trial, by varying the quantity of powder and shot in different ways, we are inclined to think there would be fewer complaints made of the modern fowling-pieces. The chief source of error appears to be that of overcharging. Every barrel, according to its caliber and weight, has a certain quantity of lead, and a suitable one of powder, which will be attended with greater certainty and effect than any others; and these must be determined by repeated trials. If we increase the quantity of shot above this, we lessen the force of discharge, and at the same time increase the recoil: and if we increase the charge of powder, that of the shot remaining the same, we also increase the recoil, and disperse the shot much more than before. In every species of fire-arms, large charges of powder are found to disperse the shot very much, whilst with smaller charges than are generally employed it is thrown more steadily and closely. If the object, therefore, which we are about to fire at, be at too great a distance for the shot to take effect, and it happens that we cannot approach nearer to it, we ought not to increase the quantity of powder with a view to the shot being thereby thrown farther, as, by so doing, the increase of the range will be very trifling, whilst the dispersion of the shot will be greatly increased. The only expedient in this case, is, to employ shot of a larger size, the quantity of it, and of the powder, being kept the same as has been already found best suited to the piece.

We cannot venture to determine what degree of closeness or dispersion in the shot will entitle any piece to the name of a good or a bad one; but would observe, that if a fowling-piece, charged with an ounce of No. 2, patent-shot, and a drachm of powder, throws sixty grains into a sheet of paper eighteen inches by twenty-four, at the distance of fifty paces, we may consider it as very capital, although these are only about one-third of the charge; and that the same piece continuing to be fired at the same mark and distance, will not, in the mean of four or five successive discharges, throw thirty-six grains into the paper; in short, that, when due attention is paid to finding the suitable quantity of powder and of shot, one piece will perform nearly as well as another.

Of rifl. barrels.—It has been found that the flight of balls, both from cannon and small arms, is liable to very considerable variations; and that the piece, notwithstanding it was firmly fixed, and fired with the same weight of powder, sometimes threw the ball to the right, sometimes to the left, sometimes above, and at other times below the mark. It has also been observed, that the degree of deflection increases in a much greater proportion than the distance o' the object fired at: thus, at double the distance the deflection of the ball from the line on which the piece is pointed is considerably more than double, and at treble the distance more than treble what it was in the first. Mr. Robins secured a musket barrel upon a block of wood, and firing it with a ball, at a board of a foot square, sixty yards distant, found that it missed the board only once in sixteen successive discharges; yet when fired with a smaller charge, at the distance of seven hundred and sixty yards, it sometimes threw the ball one hundred yards to the right, and at other times one hundred to the left of the line it was pointed in. The direction upwards and downwards also was found equally uncertain, the ball sometimes bending so much downwards as to fall two hundred yards short of its range at other times. Yet the nicest examination could not discover that the barrel had started in the least from the position in which it was first fixed.

It is impossible to fit a ball so accurately to any plain piece, but that it will rub more against one side of the barrel than another, in its passage through it. Whatever side, therefore, it rubs against on its quitting the muzzle, it will acquire a whirling motion towards that side, and will be found to bend the line of its flight in the same direction, whether it be to the right or the left, upwards, downwards, or obliquely. This deflection from a straight line arises from the resistance which the air gives to the flight of the bullet, it being greatest on that side where the whirling motion conspires with the progressive one, and least on that side where it is opposed to it: thus, if the ball, in its passage out, rubs against the left side of the barrel, it will whirl towards that side; and, as the right side of the ball will therefore turn up against the air during its flight, the resistance of the air will become greatest on the right side, and

the ball be forced away to the left, which was the direction it whirled in. If the axis round which the ball whirls preserved its position during the whole of the flight, the deflection would be in the same direction from the one end of the track to the other. But, from accidents that are unavoidable, the axis of the whirl frequently changes its position several times during the flight; so that the ball, instead of bending its course uniformly in the same direction, often describes a track that is variously contorted. So great, however, is the tendency of the ball to deflect itself towards the side it rubs against, that although, when fired out of a barrel that is bent towards the left hand, it will be thrown from the piece in the direction of the bend, yet as the ball in this case will be forced to rub against the right side of the muzzle, and thus turn its left side up against the air, so it will be found to alter its course during the flight, and bend away towards the right hand, so as to fall a considerable way to the right of the line in which the piece was pointed.

From what has been said, it will readily appear, that these variations will be more frequent and considerable when the ball runs very loose in the piece; or when, from any roughness on its surface, or on the inside of the barrel, a considerable degree of friction takes place between them. With a view to prevent friction, it has been proposed to grease the ball; but this will be of little service. All that can be done in a plain barrel, is, to have the balls cast very solid and true, and afterwards milled in the same manner as is now practised upon shot: the barrel also should be very smooth on the inside, and the ball fit it very accurately, so as to leave scarcely any windage. And yet, with the help of all these, it will still be very difficult to prevent it altogether; for gravity will constantly act, and friction on the under side will naturally be occasioned by the weight of the ball.

From considering the causes of this aberration in the flight of bullets, it will be pretty evident, that the only means of correcting it is by preventing the ball from rubbing more against one side of the barrel than another in passing through it; and by giving to the bullet a motion, which will counteract every accidental one, and preserve its direction by making the resistance of the air upon its fore part continue the same in every part of the flight. The contrivance for this purpose is termed rifling, and consists in forming upon the inside of barrels a number of furrows, either in a straight or spiral direction; into these the ball is moulded, and any rolling motion along the sides of the barrel, in its passage out, thereby prevented. Barrels of this construction have been in use upon the continent since the middle of the sixteenth century, but were little known, and still less employed in England, until within these fifty years. The spiral rifled barrels, however, have entirely superseded the straight rifled ones, because although the latter prevented the rolling motion of the ball that takes place in a plain barrel, yet they do not communicate any other motion, that could serve to correct the variations that may occur during the flight.

The furrows, or channels, which are termed the rifles, vary in number according to the fancy of the workman, or that of the purchaser, but are never less than six, or more than twelve, in a common-sized piece. Their depth is equally subject to variation; but the breadth of the furrows and of the threads is generally the same. In some pieces, the spirals make a half turn, in others three-fourths, and in others, again, an entire revolution in the length of the barrel: an entire revolution, however, is the most common, though, from the great difference in the length of rifle barrels, there should be some standard assigned for the obliquity of the spiral. There is, without doubt, a certain obliquity of the spirals which would communicate a rotary motion to the ball, sufficient to correct any aberration in its flight; and this might be determined by comparing the effects of a number of pieces, that differed only in the obliquity of the rifles. Barrels intended to be rifled are previously bored and smoothed within, in the manner already described: they are, however, forged as much thicker than plain barrels as the depth of the rifles; for, although the threads of the spiral add to the weight of the barrel they do not increase its strength in the least, with regard to the force exerted upon it by the powder.

These pieces are charged in various ways. In general, the ball, which is somewhat larger than the caliber before it was rifled, is driven down to the powder, by means of an iron rammer, struck with a mallet, whereby that zone of the ball which is in contact with the sides of the barrel becomes indented all round, and is moulded to the form of the rifles. When the piece is fired, the projections of the ball which fill the rifles, being obliged to follow the sweep of the spiral, the ball thereby acquires a rotary motion upon an axis that corresponds with the line of its direction; so that the side of the bullet which lay foremost in the barrel continues foremost during the whole of the flight. By this means the resistance of the air is opposed directly to the bullet's progress, and not exerted more against one part than another of that side which moves foremost; and accordingly the bullet preserves the line of its direction with very great steadiness.

It appears that neither the inventors of spiral rifle barrels, nor the persons who first used them, were at all acquainted with the principles upon which they produced their effects. Some were of opinion, that, owing to the ball not passing out so quickly as out of a plain barrel, the powder was more completely inflamed, and thereby exerted a greater force upon it. Others, and these by far the greater number, thought that the ball, by combining the rotary with the progressive motion, did, as it were, bore the air; thereby flying much farther, and penetrating solid bodies to a greater depth, than when discharged from a plain barrel. But Robins asserts, that as the bullet meets with a greater resistance in its passage through a rifled barrel than through a plain one; so neither its velocity, nor the distance to which it is thrown, is so great when fired from the former as when fired from the latter: and this difference will be very remarkable if the rifles be deep, and the ball fills them up completely; the friction, in that case, bearing a considerable proportion to the force of the powder. For the same reason, he says that barrels which are newly rifled, and, consequently somewhat rough within, do not throw their balls so far as they will be found to do after being used for some time, and thereby rendered smoother; and, that the mistake of those who supposed that rifle barrels threw their balls to a greater distance than plain barrels did, arose from their

finding, that, with the former, they could hit a mark at three or four times the distance they could do with a plain barrel.

Besides the method of loading a rifle-barrel gun, by driving down the ball with an iron rammer, there are several others which we shall mention. In Germany they sometimes charge them in the following manner: a piece of thin leather or fustian is cut into a circular shape, and so large as to cover a little more than half of the ball; this piece is then greased on one side, and, being placed over the muzzle, the ball is laid upon it, and both thrust down together; by this means the leather or fustian enters into the rifles, and the bullet, being firmly embraced by it, acquires the proper rotary motion in its passage through the barrel. If this method be equally effectual, it is certainly much more easy and expeditious than that already described. Some of the old pieces of this construction were charged by taking out the breech every time; and we are informed, that the pieces used by the Hessian yagers are charged the same as the common screw-barrel pistols. By far the most expeditious way of charging rifled pieces, however, is, by means of an ingenious contrivance which now generally goes under the name of Ferguson's rifle-barrels, from its having been used by major Ferguson's corps of rifle-men during the last American war. In these pieces, there is an opening on the upper part of the barrel, and close to the breech, which is large enough to admit the ball. This opening is filled by a rising screw which passes up from the lower side of the barrel, and has its threads cut with so little obliquity, that, when screwed up close, a half-turn sinks the top of it down to a level with the lower side of the caliber. For, when the ball is forced through the rifles by the effort of the powder, the friction must be considerably more than when it is moulded to them in the ramming down. It appears, however, that in whatever way the piece is charged, this friction might be much diminished, by making the channels or furrows very broad in proportion to the breadth of the threads, and, instead of leaving the latter flat on the top, to have them terminating in a sharp edge, whereby they would cut easily into the ball. This would also serve to lessen the additional quantity of metal in the barrel, which, as the rifles are now formed, bears a very considerable proportion to the weight of the whole piece. The depth of the rifles, likewise, need not be great, as a very slight hold of the ball is sufficient to communicate the desired motion: deep rifles are particularly detrimental when the piece is charged at the breech; for, if the ball be large enough to fill them up entirely, the resistance, and consequently the recoil, will be very great; and, if it does not fill the rifles, there will be so much windage, that a considerable portion of the flame will escape past it, and the force of the discharge be thereby greatly lessened.

To render rifle barrels as complete as possible, we should endeavour, by every means in our power, to diminish the friction between the bullet and the sides of the barrel. We have already mentioned some alterations which we think would conduce to this. The turns of the spiral being exactly parallel to each other, and both the threads and the furrows being made perfectly smooth, are circumstances absolutely essential to perfection; as thereby the bullet, when once put in motion, will pass through the barrel with very little friction. The most accurate method of ascertaining this is, by pouring melted lead into the barrel so as to form a cylinder of two or three inches in length, and which is exactly fitted to one portion of the caliber: if the cylinder, when moved a little, passes without stop or difficulty from one end of the barrel to the other, by being pushed gently, the rifling may be pronounced very exact. The same thing may be tried with a plug or ball of lead, driven into one end of the barrel so as to fill the rifles, and pushed forward with a ramrod.

From the imperfect manner in which any instrument works in a spiral direction within the barrel, the furrows are generally left very rough; and hence rifled pieces are found to throw their ball to a greater distance, though with equal accuracy, after being used for some time, and thereby having the bottom of the furrows, and edges of the threads, worn smooth. These might be rendered smooth at first, by means of a plug of lead or pewter, made to fit the rifles, being fixed to an iron rod, and wrought backwards and forwards in the barrel with fine emery and oil: or the leaden plug might be employed as a pattern to form one of brass or steel by, for the same purpose.

As the pieces which are charged at the breech are considerably dearer than the others, and, excepting the expedition with which they can be charged, are really inferior to those charged at the muzzle; we are of opinion, that the latter might, by a very simple means, be rendered equally serviceable with the former. This is nothing more than having the balls cast with projections that answer to the rifles; which may be done with great ease and accuracy by making corresponding hollows round a zone of the bullet-mould: by this the ball may be fitted so accurately to the rifles, as to leave scarcely any windage; whilst the friction will be less than it is either when the ball is put in at the breech, or forced in by the muzzle.

In treating of the causes of aberration in the flight of balls, we have supposed the air to be perfectly still, it being evident, that the force of the wind will affect balls considerably, whether they are fired from a plain, or from a rifled barrel; but, for the reasons already given, will affect the former in a much greater degree than the latter.

Pieces intended for shooting with ball, whether they be plain or rifled, ought to be of much more equal thickness from the breech to the muzzle, than those that are intended for shot only. In every barrel, there is an undulating vibration communicated to the metal by the explosion. This is most remarkable in a thin barrel, and when the charge is great; and may be rendered very evident by the following easy experiment: Take a piece of fine steel or iron wire, that is tempered so as not to stretch readily; pass it once round the thin part of the barrel, and twist it tight. The piece being then charged and fired, the wire will be found burst asunder, or considerably untwisted. It is evident that such a degree of vibration in the barrel must have an effect upon the ball in its passage through it; and that the only means of preventing it is, by having an additional quantity of metal in the barrel, and especially in the fore part of it. The same circumstance certainly obtains, though in a much less degree, in fowling-pieces; and, on this account, as well as on that of the recoil, a barrel which is strong enough to withstand any charge that is required, may yet have too small a quantity of metal in it.

Having now fully explained the principles upon

which rifle barrels produce their effects, our readers will be prepared to consider how far the straight rifling can be useful when employed for shot. *These pieces are said to be very common in Germany, and are used by a few persons in this country;* though we understand that the greater number even of these few are now less partial to them than they were at first. If the divergency of shot arises from the same cause as that of ball, viz. from acquiring a whirling motion to one side or other by rubbing against the sides of the piece, it is evident that rifling the barrel can have no tendency to prevent this. For let it be granted, that the channels or flutings within are semicircular, and that the shot is exactly adapted to these (two circumstances said to be necessary to the perfection of these pieces) it cannot be imagined that grains will acquire less of the rolling motion in passing along these flutings, than in passing along the sides of a plain barrel; on the contrary, it will necessarily be greater, as the points of contact are considerably more numerous.

FOWLS, in husbandry, are well-known domestic birds, without the assistance of which the farmer's stock cannot be said to be complete; and the advantage of which must appear to every one who keeps them. And so equal is the distribution of their bounties, and so trifling the expense attending them, that the poorest villager may reap the same benefit from their products as the most substantial farmer. It is singular that there should be no specific name for the bird in the English language; fowl, cock, and hen, being general names applicable to the whole winged creation. For the best methods of breeding fowls see POULTRY, and HUSBANDRY.

FOWLS, in the sportsman's dialect, are generally classed under three distinct heads; *domestic fowls*, consisting of cocks, hens, geese, and ducks. *Wild fowls*, limited to birds of flight and passage, as sea-gulls and geese, wild ducks, widgeon, teal, curlews, plovers, woodcocks, and snipes. *Game fowls*, which, in the earliest acts of parliament, were extended to a very long list, including even the heron, mallard, duck, and teal. All these, however, are discarded from the game-list in modern practice, and the whole recognised under this head are the pheasant, partridge, grouse, or red game, and heath fowl, or black game.

FOX, in mastiology. See CANIS.

FOX, a knave, or cunning fellow.

FOX (John), the martyrologist, was born at Boston in Lincolnshire, in the year 1517. At the age of 16 he was entered a student of Brazen-nose college, in Oxford; and in 1543 he became master of arts, and was chosen fellow of Magdalen college. He discovered an early genius for poetry, and wrote several Latin comedies, the subjects taken from scripture, which his son assures us were written in an elegant style. Forsaking the muses, he now applied himself with uncommon assiduity to the study of divinity, particularly church-history; and discovering a premature propensity to the doctrine of the reformation, he was expelled the college as an heretic. His distress on this occasion was very great; but it was not long before he found an asylum in the house of sir Thomas Lucy, of Warwickshire, who employed him as a tutor to his children. Here he married the daughter of a citizen of Coventry. Sir Thomas's children being now grown up, after residing a short time with his wife's father, he came to London; where, finding no immediate means of subsistence, he was reduced to the utmost degree of want; but was at length (as his son relates) miraculously relieved in the following manner: As he was one day sitting in St. Paul's church, emaciated with hunger, a stranger accosted him familiarly, and, bidding him be of good cheer, put a sum of money into his hand; telling him at the same time, that in a few days new hopes were at hand. He was soon after taken into the family of the duchess of Richmond, as tutor to the earl of Surrey's children, who, when their father was sent to the Tower, were committed to her care. In this family he lived, at Ryegate, in Surrey, during the latter part of the reign of Henry VIII, the entire reign of Edward VI. and part of that of queen Mary: but at length, persecuted by his implacable enemy bishop Gardiner, he was obliged to seek refuge abroad. Basil in Switzerland was the place of his retreat, where he subsisted by correcting the press. On the death of queen Mary he returned to England; where he was graciously received by his former pupil the duke of Norfolk, who retained him in his family as long as he lived, and bequeathed him a pension at his death. Mr. secretary Cecil also obtained for him the rectory of Shipton near Salisbury; and we are assured that he might have had considerable church-preferment, had it not been for his unwillingness to subscribe to the canons. He died in the year 1587, in the 70th year of his age; and was buried in the chancel of St. Giles's, Cripplegate. He was a man of great industry, and considerable learning; a zealous, but not a violent reformer; a nonconformist, but not an enemy to the church of England. He left two sons; one of whom was bred a divine, the other a physician. He wrote many pieces; but his principal work is, the Acts and Monuments of the Church, &c. commonly called Fox's Book of Martyrs. His facts are not always to be depended on, and he often loses his temper; which, considering the subject, is not much to be wondered at.

FOX (George), the founder of the sect of quakers, was born at Drayton, in Leicestershire, in 1624. He was at first placed with a shepherd, and afterwards bound apprentice to a shoemaker; but it does not appear that he ever followed either of those professions. In 1643 he became a religious itinerant; and about 1647 commenced public preacher, inveighing, not only against the prevailing vices, but the stated ministers and religious services, affirming that the light of Christ in the heart is alone the means of salvation, and the true qualification for the gospel ministry. He suffered imprisonment in many places, and sometimes experienced very cruel usage. In 1669 he married the widow of a Welch judge; but

still he continued his course of itinerant preaching, and visited most parts of the British islands, Holland, Germany, and North America, and *even some of the West-India islands. He died in London in 1690. His Journal was printed* at London in 1694, his Epistles in 1698, and his Tracts in 1706; all in folio.

Fox (Charles James), an eminent statesman, the third son of Henry Fox, afterwards lord Holland, by Georgina, eldest daughter of the late duke of Richmond, was born on the 13th of January, O.S. in the year 1748.

As he was intended for public life, so he received a public education, and was sent to Eton, when that school had attained a high degree of celebrity, under the auspices of Edward Barnard, M.A. who became head master in 1754.

From Eton Mr. Fox removed to Hertford college, Oxford, where he also distinguished himself by his talents, and Dr. Newcome, his tutor, was afterwards rewarded with the primacy of Ireland for his services on this occasion. After remaining there some time, he was immediately sent on his travels, according to the absurd custom of that day, by which an Englishman was bound to be better acquainted with the manners, fashions, and productions of every other country in Europe than his own.

Meanwhile, his father, still keeping the original object in view, determined to inspire him with a taste for public business, and accordingly, in the beginning of 1768, he was returned for Midhurst, in the county of Sussex. Two things are remarkable on this occasion; the first is, that, like the celebrated Waller, he became a member of the house of commons before he attained the legal age: the second, that Midhurst was one of those very boroughs which he himself seems afterwards to have considered a nuisance in a free country.

As lord Holland possessed the favour of lord Bute, and enjoyed the confidence of his present majesty, the career of public employments lay open to his son. Accordingly, he had been only two years in parliament when, on the 13th of February, 1770, he became a member of the Admiralty board, at the time when the celebrated admiral sir Edward, afterwards lord Hawke, presided there. On May 6, 1772, he resigned that situation, and on the 9th of January, 1773, was nominated a commissioner of the treasury.

At this period his political principles appear to have been strictly in unison with those of his father, and he was often afterwards reminded by his adversaries that the doctrines advanced by him in the case of the printers who had been imprisoned, were rather unfavourable to the principles of liberty, while his assertion, "that the voice of the people was only to be heard in the house of commons," was controverted by the whole tenor of the latter part of his life.

At length all the predictions of Mr. Fox and his associates, relative to the American struggle, were fully and fatally verified; for Burgoyne was captured, Cornwallis was obliged to capitulate, and France and Holland having become parties in the struggle, the contest itself became unpopular in the extreme. Lord North, *confounded, overwhelmed, and almost driven to despair, was now obliged to resign;* but he did not, like former ministers, take refuge in the house of peers; on the contrary, he remained in the midst of his partisans, who still formed a numerous band, braved all the clamours of his adversaries, defied their threats, and declared himself ready to meet any inquiry they might wish to institute.

Mr. Fox obtained the office of secretary for foreign affairs, in the spring of 1782, while the marquis of Rockingham, the most uniform honest and upright statesman whom we have possessed since the revolution, was nominated first lord of the treasury. Much was expected from, and much, it must be owned, was performed by a ministry, the most respectable of any that has been seen in England during the present reign. But the sudden death of the nobleman just mentioned at once afflicted the nation and divided the friends of liberty, while the ex-minister and his adherents knew how to derive advantage from the storm, and reap benefit from the dismay that unhappily ensued

A dispute, as had been foreseen, immediately took place about who should succeed as first lord of the treasury. The candidates were, lord Shelburne, afterwards marquis of Lansdowne, and the present duke of Portland; the favour of the king made the interest of the former preponderate, and a schism having ensued, Mr. Fox retired in disgust. As the earl of Chatham was accustomed to observe, "that he would never be responsible for actions which he did not direct," so the secretary of state, when he withdrew, remarked, "that he had determined never to connive at plans in private, which he could not publicly avow."

What those plans may have been, we are left to guess. We have reason to believe, that the only ostensible dispute in the cabinet was relative to the independence of America, which Mr. Fox wished to grant as a boon, while lord Shelburne desired to confer it in the manner of a bargain: the secret, and perhaps leading cause, on the present occasion, originated in friendship to the duke of Portland, then a very popular nobleman, whose exclusion had produced the most fatal jealousies among the best friends of liberty.

Mr. Fox now resumed his old seat, facing the Treasury bench, while his former colleague, the earl of Shelburne, was busied in concluding a peace with France, Spain, Holland, and the United States of America. This nobleman, although possessed of great talents, forgot to adopt the most obvious means for ensuring his own safety. In the first place, he did not call a new parliament, and in the next, he omitted to secure the immense advantages resulting from the press, which, in a free country, will always influence, if not govern, the nation. But even as it was, he would have triumphed, but for a most odious as well a impolitic coalition, supposed to be bottome

on ambition alone, and destitute of any common principle of union.

The political success of Mr. Fox and lord North was, however, ephemeral. While they agreed in no one great measure for the common good, the nation seemed to unite as one man against them; and the king having become jealous of his prerogative, on the introduction of the East India Bill, they were obliged to retire, but not until means had been resorted to, which no friend of the constitution could either advise or practise.

A phenomenon in the political world now took place; for a stripling, just of age, upborne on the wings of royal and popular favour, succeeded to the post of premier, and kept it for upwards of twenty years. William Pitt, the younger son of that William Pitt, earl of Chatham, who had been the rival of Henry Fox, lord Holland, to a greater portion of eloquence than his father, added all his ambition. Such was the opponent with whom the subject of this memoir had now to contend for the government of the empire; such the man who could only be prevailed upon to relinquish it with his life! Meanwhile the tide of popularity had set in so strongly against Mr. Fox, that at the general election, in 1784, many of his friends lost their seats in the House of Commons, and he himself was obliged to enter into a long and expensive contest for Westminster.

The next public affair in which we find him engaged, was the prosecution of Mr. Hastings; and it must be allowed, while the charges against the governor general of India, on one hand, required, nay demanded investigation, that, on the other, the period of time to which the trial was protracted appears to have been equally impolitic and unjust.

On two great occasions the talents of Mr. Fox proved eminently serviceable to the nation: one, when Mr. Pitt, at the instigation of the court of Berlin, wished to wage an unprofitable war with Russia, relative to the possession of Oczakow; the other, when, in the wantonness of power, he urged a contest with Spain. Experience has since proved that these objects were contemptible, and the finger of posterity will point with scorn to that page of our history, when a minister who derived all his credit from his management of the finances, laboured to impoverish the nation by two ridiculous, but bloody conflicts, one of which had for its object the preservation of the Turkish frontier, and the other, a participation in the trade of cat-skins and sea-otters!

In 1788, Mr. Fox, worn out, and perhaps disgusted with public business, repaired to the continent, in company with the lady who has since been acknowledged as his wife, and after spending a few days with Gibbon the historian, at Lausanne, entered the classic regions of Italy. But he was suddenly recalled, in consequence of the alarming illness of the king, and the business of the Regency Bill was so ably managed by his rival, who now perceived it to be for his interest to stand on constitutional grounds, that the opposition rather lost than gained popularity by this measure.

We now approach an awful and memorable epoch, that which gave birth to the French Revolution! *On this occasion Mr. Fox declared himself strongly, uniformly, and decisively* on the side of liberty. The two great rival chiefs, who agreed in nothing else, at first cordially united in this cause, and while the one presaged a long peace, the extinction of our national debt, and the prosperity of the empire, the other gloried in beholding a whole people rescued from the most oppressive servitude, and, at the same time, augured the most auspicious results in favour of the human race.

It were greatly to be wished that the grand political experiment attempted in France had been left to its own fate. The intervention of the neighbouring states only served to arouse the warlike genius of a mighty people, to call forth the numerous resources of a rich and extensive empire, and finally to establish a military despotism, that, after overturning every land-mark of civil liberty, has nearly extinguished the independence of Europe.

Mr. Pitt is supposed to have been at first dragged into the contest with reluctance. No sooner had he entered on it, however, than, as usual, he did not hesitate at the means by which he was to secure the end in view. Incorruptible himself, he opened the public purse without scruple to others. The heroic age of profusion seemed to have arrived, and he distributed money, and titles, and offices, with so liberal a hand, that the opposition benches were thinned of their members, and his ancient enemy was left to contend with a handful of adherents against a host of foes.

Conscious that he could not oppose the golden torrent that issued from the Treasury bench, Mr. Fox withdrew from Parliament for a while, and evinced a wish to retire altogether from public business. It has even been said, that his Address to the Electors of Westminster was actually penned, and that he had formed the determined resolution of abjuring politics for ever.

But the entreaties of his friends, and the occurrence of new and singular events, happily prevented this measure. We accordingly find him once more at the head of an opposition, feeble in point of numbers, but truly formidable in respect of talents and abilities. Mr. Pitt, then in the zenith of his power, at this period afforded a fair opportunity of animadversion as well as censure, and it was eagerly seized upon by his eloquent rival. The minister, confident in his majority, took upon him, during the vacation of Parliament, to advance a sum of money, by way of subsidy, to the emperor and the French princes, without either the consent or knowledge of the House of Commons. In 1796 this became the subject of a special charge; and although Mr. Fox's motion was not carried, yet it made an impression on the nation at large, and added not a little to the odium then prevalent against the premier

At length, after enjoying, and, in some measure, revelling in power, during eighteen long years, Mr. Pitt voluntarily retired from office, and Mr. Addington, since created viscount Sidmouth, concluded the treaty of Amiens, on *which occasion he received the support of Mr. Fox and all his friends.* The latter may be said to have now experienced that species of triumph which arises out of political anticipation, for as the terms were not so good as might have been obtained in 1796, it was obvious that all the miseries, calamities, blood, and treasure, wasted to no manner of purpose during the preceding six years, would have been avoided, had his warning voice been but listened to.

When a renewal of the contest was meditated, Mr. Fox expressed himself avowedly hostile to that measure: "I do contend," said he, "that the continuance of peace is infinitely desirable. I feel its importance in the strongest manner, and I am not ashamed to avow an opinion for which I have not unfrequently been exposed to ridicule. I now again explicitly declare, that I consider the preservation of national honour to be the only legitimate cause of war.

"This docrine I hold," continues he, "on the plain principle that honour is inseparably connected with self-defence. If it can be proved to me that the national honour has been insulted, or the national dignity disgraced, I will, without hesitation, declare my opinion, which is, that it would be a fair legitimate cause for recommencing hostilities. I must, however, hear a very strong case made out before I can give my vote for re-plunging the country into those disasters, which a calamitous contest had produced, and from which we have been so recently delivered."

It was in strict consistency with this notion, that, when the royal message was brought down, declaratory of hostilities, Mr. Fox expressed his opinion at large, both against the war as unnecessary, and against the crisis at which it took place, as eminently impolitic. This problematic measure soon proved fatal to Mr. Addington's administration, and the reins of government having dropped from his hands, were immmediately seized by Mr. Pitt.

Meanwhile a union had been effected by the Foxite and Grenville parties, and from that moment the return of both to power was considered as certain. This was in part evinced by the conduct of the House of Commons, in respect to the prosecution of lord Melville; and although the petition of the Irish Catholics was thrown out by a great majority, yet a large portion of the empire was, in some measure, conciliated on this occasion, by the consideration that it was not destitute of powerful protection.

In the midst of these discussions, Mr. Pitt, who had been for some time tottering, sickened and died. A vote of Parliament, public funeral, and the payment of his debts at the expence of the nation, added to his sudden fate and acknowledged talents, all tended to render his memory respected; but what contributed more than any thing else to shield it from reproach, was the junction of his friends and relations with his enemies and opponents; so that the latter could not have assailed his character without violating all the decencies of *life with respect to the former.*

After an opposition of twenty-two years—a period unexampled, in point of duration, in the annals of this country—Mr. Fox in 1806 resumed his situation as Secretary of State for the Foreign Department, which he had surrendered in 1783-4. Soon after this event, the conduct of the king of Prussia excited general indignation. Not content with seizing on Hanover, he excluded the English commerce not only from his own dominions, but also from every port which he could either terrify or influence. On this the new minister published a very spirited declaration, and, at the same time, adopted measures for blockading all the ports and intercepting all the trade of the house of Brandenburg.

But his mind was never for a single instant diverted from what may be considered as the grand object of his life. He had conceived an idea, from the very beginning, that the war was ill-timed, and no sooner had he obtained the seals, than he determined, if possible, to put an honourable termination to it. As he had never made use of any intemperate language, or displayed any personal antipathies, the enemy of course could have no objection to such a mediator; but just at the critical period, when it was supposed that most of the difficulties had been removed, the man on whose fate the peace of the world in no small degree depended was snatched away from his friends and the world, by a confirmed dropsy. He died Sept. 13, 1806.

To depict the character of such a man as Mr. Fox, is a most difficult and delicate task: we shall present our readers with a sketch drawn by the able hand of Sir James Macintosh.

"Mr. Fox united, in a most remarkable degree, the seemingly-repugnant characters of the mildest of men and the most vehement of orators. In private life he was gentle, modest, placable, kind, of simple manners, and so averse from parade and dogmatism, as to be not only unostentatious, but even somewhat inactive, in conversation. His superiority was never felt but in the instruction which he imparted, or in the attention which his generous preference usually directed to the more obscure members of the company. The simplicity of his manners was far from excluding that perfect urbanity and amenity which flowed still more from the mildness of his nature than from familiar intercourse with the most polished society of Europe. His conversation, when it was not repressed by modesty or indolence, was delightful. The pleasantry, perhaps, of no man of wit had so unlaboured an appearance; it seemed rather to escape from his mind, than to be produced by it. He had lived on the most intimate terms with all his contemporaries, distinguished by wit, politeness, or philosophy, or learning, or the talents

of public life. In the course of thirty years, he had known almost every man in Europe whose intercourse could strengthen, or enrich, or polish the mind. His own literature was various and elegant. In classical erudition, which, by the custom of England, is more peculiarly called learning, he was inferior to few professed scholars. Like all men of genius, he delighted to take refuge in poetry from the vulgarity and irritation of business. His own verses were easy and pleasing, and might have claimed no low place among those which the French call *vers de société*. The poetical character of his mind was displayed in his extraordinary partiality for the poetry of the two most poetical nations, or, at least, languages, of the West,—those of the Greeks and of the Italians. He disliked political conversation, and never willingly took any part in it. To speak of him justly as an orator would require a long essay. Every where natural, he carried into public something of that simple and negligent exterior which belonged to him in private. When he began to speak, a common observer might have thought him awkward, and even a consummate judge could only have been struck with the exquisite justness of his ideas, and the transparent simplicity of his manners. But no sooner had he spoken for some time, than he was changed into another being. He forgot himself and every thing around him. He thought only of his subject. His genius warmed and kindled as he went on. He darted fire into the audience. Torrents of impetuous and irresistible eloquence swept along their feelings and conviction. He certainly possessed, above all moderns, that union of reason, simplicity, and vehemence, which formed the prince of orators. He was the most Demosthenean speaker since Demosthenes. 'I knew him,' says Mr. Burke, in a pamphlet written after their unhappy difference, 'when he was nineteen; since which time he has risen, by slow degrees, to be the most brilliant and accomplished debater that the world ever saw.' The quiet dignity of a mind roused only by great objects, the absence of petty bustle, the contempt of show, the abhorrence of intrigue, the plainness and downrightness, and the thorough good-nature which distinguished Mr. Fox, seemed to render him no very unfit representative of that old English national character, which, if it ever changed, we should be sanguine indeed to expect to see succeeded by a better. The simplicity of his character inspired confidence, the ardour of his eloquence roused enthusiasm, and the gentleness of his manners invited friendship. 'I admired,' says Mr. Gibbon, 'the powers of a superior man, as they are blended, in his attractive character, with all the softness and simplicity of a child; no human being was ever more free from any taint of malignity, vanity, or falsehood.' From these qualities of his public and private character, it probably arose, that no English statesman ever preserved, during so long a period of adverse fortune, so many affectionate friends and so many zealous adherents. The union of ardour in public sentiment with mildness in social manners was in Mr. Fox an hereditary quality. The same fascinating power, over the attachment of all who came within his sphere, is said to have belonged to his father; and those who know the survivors of another generation will feel that this delightful quality is not yet extinct in the race.

"Perhaps nothing can more strongly prove the deep impression made by this part of Mr. Fox's character than the words of Mr. Burke, who, in 1797, six years after all intercourse between them had ceased, speaking to a person honoured with some degree of Mr. Fox's friendship, said: 'To be sure, he is a man made to be loved!' and these emphatical words were uttered with a fervour of manner which left no doubt of their heartfelt sincerity.

"These few hasty and honest sentences are sketched in a temper too sober and serious for intentional exaggeration, and with too pious an affection for the memory of Mr. Fox to profane it by intermixture with the factious brawls and wrangles of the day. His political conduct belongs to his history. The measures which he supported or opposed may divide the opinion of posterity, as they divided those of the present age. But he will most certainly command the unanimous reverence of future generations, by his pure sentiments towards the commonwealth; by his zeal for the civil and religious rights of men; by his liberal principles, favourable to mild government, to the unfettered exercise of the human faculties, and the progressive civilization of mankind; by his ardent love for a country, of which the well-being and greatness were, indeed, inseparable from his own glory; and by his profound reverence for that free constitution, which he was universally admitted to understand better than any other man of his age, both in an exactly-legal and in a comprehensively-philosophical sense."

Since the death of this distinguished statesman, his nephew lord Holland has published a work which employed much of the latter part of Mr. Fox's life, entitled "A History of the early Part of the Reign of James the Second, with an introductory Chapter;" a work which is more especially celebrated for its freedom from party bias, and for the perspicuity and simplicity of the style.

FOX-HUNTING. The hunting of foxes with hounds trained to the sport. This, by sportsmen, is regarded as the zenith of enjoyment. The chace should be short, sharp, decisive;—not less than one hour to be perfect, but never more than two. If it exceed the last period, there must be a fault somewhere: in the day, the huntsmen, or the hounds. Of course, all is bustle and expedition. Yet the hounds should not be suffered to try their full strength, at the commencement of the chace: for they have then a great chance of out-stripping the scent, which they should be introduced to coolly, till they are perfectly acquainted with it. After this they cannot make too much speed. The scent, however, varies in keenness and punctuality from a variety of causes: a moist air holds and communicates it better than a dry air, and some soils destroy it more than others,

by imbibing the odour themselves, or intermixing other odours with it. When the gravity of the air suffers the scent to remain buoyant just breast high, it is a most fortunate circumstance for the pack. The more rapid the animal, again, the less the scent communicated. The scent, however, scarcely ever lies with a north or an east wind; a southerly wind without rain, and a westerly wind that is not rough, are the best.

On first finding a fox, the huntsman should draw quietly and up the wind; the fox does not, in this case, readily hear till the hounds are all in, noise can then do no hurt, and the hounds are inspirited by it. While the hounds are drawing, the company should so place themselves that a fox cannot go off unseen: upon such occasions, if two gentlemen keep close together, instead of assisting in the discovery, it is clear that one of them at least, if not both, knows nothing of the matter. The true sportsman will not draw a cover near the kennel in the commencement of the season, but will keep this as a reserve when the more distant covers are exhausted; of the first he is sure at any time.

A perfect knowledge of feeding and drafting hounds is of essential consequence; for good hounds will require but little assistance afterwards. By the first is meant the bringing a hound into the field in his highest vigour, by a full or sparing feed according to his temperament; by the second, the taking out no unsteady hound, nor any that are not likely to be of service to the pack.

With a high scent hounds cannot be pushed on too much; screams keep the fox forward, the hounds together, or let in the tail hounds: halloos are of service when hounds are running up the wind, for then none but the tail hounds can hear them; when running down the wind, on the contrary, there should be no more halloos than are necessary to bring the tail hounds forwards. *Halloo forward* is a necessary and useful cry, but is employed too indiscriminately: the hounds should only know it to signify that a fox is found—they will then fly to it. *Gone away*, is a halloo that denotes a fox has broke cover, and should certainly be restrained to that occasion, when it cannot be given too loudly. When a fox is killed he should first be flung across the branch of a tree to be bayed a few minutes, then with a loud *Tally ho*, the meaning of which the hounds will thus understand, he should be hurled amongst them to be eaten ravenously. It will make them the more eager. No good country should be hunted after February: no country at all after March.

A fox-hunting establishment consists, when complete, of a first and second huntsman, first and second whipper-in, three horses for each of the first, and two for each of the last: from twenty-five to thirty-five couples of hounds, terriers, helpers, earth-stoppers, and dog-feeders.

FOX-CHASE. See CHASE.

FOX-EVIL, a disease in which the hair drops off from the head.

FOX-GLOVE, in botany. See DIGITALIS.

FOX-GLOVE (False), in botany. See MIMULUS.

FOXFORD, a town in Ireland, in the county of Mayo, situate on the river May, 8 miles N. of Castlebar.

FOX-ISLANDS, a group of islands in the N. Archipelago. They are 16 in number, and are situated between the E. coast of Kamtschatka and the W. coast of America, between 52° and 55° N. lat. Each island has a peculiar name; but this general name is given to the whole group, on account of the great number of black, grey, and red foxes with which they abound. The dress of the inhabitants consists of a cap, and a fur coat, which reaches down to the knee. Some of them wear common caps of a party-coloured bird-skin, upon which they leave part of the wings and tail. On the fore part of their hunting and fishing caps they place a small board, like a skreen, adorned with the jawbones of sea-bears, and ornamented with glass beads, which they receive in barter from the Russians. At their festivals and dancing parties, they use a much more showy sort of caps. They feed upon the flesh of all sorts of sea animals, and generally eat it raw. But when they dress their food, they make use of a hollow stone, in which they place the fish or flesh: they then cover it with another, and close the interstices with lime or clay. They next lay it horizontally on two stones, and light a fire under it. The provision intended for keeping is dried without salt in the open air. Their weapons are bows, arrows, and darts; and, for their defence, they use wooden shields. The most perfect equality reigns among them. They have neither chiefs nor superiors, neither laws nor punishments. They live together in families, and societies of several families united, which form what they call a race, who, in case of attack or defence, mutually aid each other. The inhabitants of the same island always pretend to be of the same race.

FO'XSHIP. *s.* (from *fox.*) The character or qualities of a fox; cunning (*Shakspeare*).

FO'XTRAP. *s.* (*fox* and *trap.*) A gin or snare to catch foxes (*Tatler*).

FOY. *s.* (*foi*, French.) Faith; allegiance (*Spenser*).

FOYLE (Lough), a lake or bay of Ireland, in Londonderry. It is of an oval form, 14 miles long and eight broad, and communicates with the ocean by a short and narrow strait.

To FRACT. *v. a.* (*fractus*, Latin.) To break; to violate; to infringe (*Shakspeare*).

FRA'CTION. *s.* (*fraction*, French.) 1. The act of breaking; the state of being broken (*Burnet*). 2. A broken part of an integral (*Brown*).

FRACTION, in arithmetic, and algebra, is a part or some parts of another quantity or number considered as a whole but divided into a certain number of parts: as 3-4ths of any quantity, a pound, for instance, which denotes 3 parts out of 4, or 15 shillings.

Fractions are usually divided into vulgar, decimal, duodecimal, sexagesimal. The first

kind is what we speak of here; for the last three sorts, see DECIMAL, &c.

"The definitions of fractions,' says bishop Horsley, "which we find in the common books of arithmetic, that a fraction is a broken number, or that it is a number less than unity, are absurd and unintelligible. Number, in its own abstract nature, is composed of unity; and unity, in the abstract, is indivisible: a number, therefore, cannot otherwise be broken, than into less numbers; or into the units of which it is composed. The ultimate division of number is into units; and below a unit there is no number. But, considering number not in the abstract, but as existing in the things numbered, the unit of these embodied numbers exists in the individuals, of which the multitude is composed; that is, in each individual separately taken. Each individual is no otherwise one, or no otherwise partakes of unity, than as it is a whole. And, as a whole, it must be composed of parts, for to be composed of parts is essential to a whole; for a whole is that from which no part is absent. A whole, therefore, as a whole, is one; but as composed of parts, it is many. The unit, therefore, of embodied numbers, is many in one; and, by dividing the whole into its parts, this concrete one is resolved into its many. And these many parts among themselves, and with relation to the whole, are no less the subject of numeration, than the wholes making multitudes. These parts, considered in their relation to the whole, are called fractions, the whole being usually called an integer. And the arithmetic of fractions is the art of numbering them as parts of a whole, and of performing the like operations upon them, for combining or separating them; as are performed by the rules of common arithmetic upon numbers properly so called, that is, upon integral numbers.' (Elementary Treatises on Practical Math.) Nearly to the same purpose speaks Malcolm at pp. 19, 20, of his Arithmetic.

Vulgar Fractions are usually denoted by two numbers, the one set under the other, with a small line between them: thus $\frac{3}{4}$ denotes the fraction three fourths of some whole quantity considered as divided into four equal parts.

The lower number 4, is called the denominator of the fraction, shewing into how many parts the whole or integer is divided; and the upper number 3, is called the numerator, and shews how many of those equal parts are contained in the fraction. Hence it follows, that as the numerator is to the denominator, so is the fraction itself to the whole of which it is a fraction; or as the denominator is to the numerator, so is the whole or integer to the fraction: thus, the integer being denoted by 1, as $4 : 3 :: 1 : \frac{3}{4}$ the fraction. And hence there may be innumerable fractions all of the same value, as there may be innumerable quantities all in the same ratio, viz. of 4 to 3; such as 8 to 6, or 12 to 9, &c. So that if the two terms of any fraction, i. e. the numerator and denominator, be either both multiplied or both divided by any number, the resulting fraction will still be of the same value: thus, $\frac{3}{4}$ or $\frac{6}{8}$ or $\frac{9}{12}$ or $\frac{12}{16}$, &c. are all of the same value with each other.

Fractional expressions are usually distinguished into proper and improper, simple and compound, and mixt numbers.

A Proper Fraction, is that whose numerator is less than the denominator; and consequently the fraction is less than the whole or integer; as $\frac{3}{4}$.

Improper Fraction, is when the numerator is either equal to, or greater than, the denominator; and consequently the fraction either equal to, or greater than, the whole integer, as $\frac{4}{4}$, which is equal to the whole; or $\frac{5}{4}$, which is greater than the whole.

Simple Fractions, or *Single Fractions*, are such as consist of only one numerator, and one denominator; as $\frac{3}{4}$, or $\frac{5}{4}$, or $\frac{12}{25}$.

Compound Fractions are fractions of fractions, and consist of several fractions, connected together by the word *of*: as $\frac{2}{3}$ of $\frac{3}{4}$, or $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$.

A Mixt Number consists of an integer and a fraction joined together: as $1\frac{3}{4}$, or $12\frac{2}{3}$.

The arithmetic of fractions consists in the REDUCTION, ADDITION, SUBTRACTION, MULTIPLICATION, and DIVISION of them. See the various articles; see also ALGEBRA and ARITHMETIC.

Algebraic Fractions, or *Fractions in Species*, are exactly similar to vulgar fractions, in numbers, and all the operations are performed exactly in the same way; therefore the rules need not be repeated, and it may be sufficient here to set down a few examples to the foregoing rules. Thus,

1. The fraction $\frac{aab}{bc}$ abbreviates to $\frac{aa}{c}$.

2. $\frac{a^3-a^2x+ax^2-x^3}{a^2-ax}=\frac{a^2+x^2}{a}$, by dividing by $a-x$. See COMMON MEASURE.

3. $\frac{a}{b}$ and $\frac{c}{d}$ become $\frac{ad}{bd}$ and $\frac{bc}{bd}$, when reduced to a common denominator.

4. $\frac{a}{b}+\frac{c}{d}=\frac{ad+bc}{bd}$. See ADDITION.

5. $\frac{a}{x}-\frac{b}{z}=\frac{az-bx}{xz}$. See SUBTRACTION.

6. $\frac{a}{b}\times\frac{c}{d}=\frac{ac}{bd}$. See MULTIPLICATION.

7. $\frac{a}{x}\div\frac{b}{z}=\frac{a}{x}\times\frac{z}{b}=\frac{az}{bx}$. See DIVISION.

Continued Fraction, is a fraction whose denominator is an integer with a fraction, which latter fraction has for its denominator an integer and a fraction, and the same for this last fraction again, and so on, to any extent, whether supposed to be infinitely continued, or broken off after any number of terms. Euler, Analys. Inf. vol. 1. p. 295.

As $\cfrac{1}{2+\cfrac{2}{3+\cfrac{3}{4+\cfrac{4}{5+\&c.}}}}$

Or using letters instead of numbers,

$$\cfrac{1}{a+\cfrac{1}{b+\cfrac{1}{c+\cfrac{1}{d+\cfrac{1}{e+\&c.}}}}} \quad \text{or} \quad \cfrac{a}{b+\cfrac{c}{d+\cfrac{e}{f+\&c.}}}$$

These continued fractions may be reduced to those of the common form by an easy application of the usual rules for fractions; for an example we will take that continued fraction which expresses the ratio of the circumference of a circle, to the diameter, namely,

$$3+\cfrac{1}{7+\cfrac{1}{15+\cfrac{1}{1+\cfrac{1}{292+\cfrac{1}{1+\cfrac{1}{1+\&c.}}}}}}$$

Here, if we stop at $\frac{1}{7}$, we shall have $3+\frac{1}{7}=\frac{21+1}{7}=\frac{22}{7}$. If we stop at $\frac{1}{15}$, we shall have

$$3+\cfrac{1}{7+\cfrac{1}{15}}=3+\cfrac{1}{\frac{106}{15}}=3+\frac{15}{106}=\frac{318+15}{106}=\frac{333}{106}$$

But if we stop at $\frac{1}{1}$, which is convenient on account of the small fraction $\frac{1}{292}$, added to the last denominator, 1, we shall then find,

$$3+\cfrac{1}{7+\cfrac{1}{15+\cfrac{1}{1}}}=\frac{353}{113}.$$ The first of the reductions gives the proportion of Archimedes, and the last that of Adrian Metius.

The doctrine of continued fractions does not appear to have been so much cultivated as it deserves: the best treatises upon it, however, and the best exemplifications of its use, are given in Wallis's Arith. Infin.; Euler's Analys. Infin. Hutton's Tracts; and Lagrange's Additions to Euler's Algebra.

Vanishing Fractions. Such fractions as have both their numerator and denominator vanish, or equal to 0, at the same time, may be called vanishing fractions. We are not hastily to conclude that such fractions are equal to nothing, or have no value; for that they have a certain determinate value, has been shewn by some very able mathematicians.

Different methods have been adopted for valuing these fractions. One is to divide the fluxion of the numerator by that of the denominator for the value: thus, in the fraction $\frac{x-x^5}{1-x}$ when $x=1$; the fluxion of the numerator is $\dot{x}-5x^4\dot{x}$, and that of the denominator is $-\dot{x}$: hence, $\frac{\dot{x}-5x^4\dot{x}}{-\dot{x}}=\frac{1-5x^4}{-1}=\frac{1-5}{-1}=\frac{-4}{-1}=4$, the value of the fraction. A second method is by common division: thus, in the same example, $\frac{x-x^5}{1-x}=x+x^2+x^3+x^4=$ (when $x=1$) $1+1+1+1=4$. A more general method, however, is that of substituting for the variable quantity its magnitude, when the numerator and denominator vanish, increased by another variable quantity; then supposing this latter to decrease without limit, the value of the proposed fraction will be known: taking again the same example, and putting $1+z$ for x, we have $\frac{x-x^5}{1-x}=\frac{\overline{1+z}-\overline{1+z}^5}{-z}=\frac{z-5z^4}{-z}=$ nearly $\frac{1-5}{-1}=4$, as before.

These vanishing fractions have led to some sharp contests among algebraists; as between Varignon and Rolle, between Maseres and Waring, &c. And in one instance, it is said, a superior knowledge of such fractions was the means of obtaining a professorship: though we trust appointments to professorships seldom depend upon such equivocal proofs of merit.

Mr. Woodhouse, in his Principles of Analytical Calculation, a work in which he has taken great pains to unsettle every thing, but to settle nothing, has revived some of the objections formerly brought against vanishing fractions: he produces the instance $\frac{x^2-a^2}{x-a}$ among others, and asserts, not, as appears to us, from the most cogent reasons, that this fraction is not $=x+a$, in the particular case when $x=a$. His mistake, we think, lies in this, that he takes the cyphers to which both the numerator and denominator reduce, as like and equal quantities, which cannot be the case; for since x^2-a^2 may be considered as a plane and $x-a$ as a line, the cyphers must be looked upon as cyphers of different orders. For the sake of the young student, we will consider this matter a little more particularly. Let us examine an instance like that above mentioned, namely, $\frac{a^2-x^2}{a-x}$, and let us suppose $a=10$, considering x as a varying quantity.

$a=10$	$x=$	$\frac{a^2-x^2}{a-x}$	$=a+x$
	-13	-3	$10-13$
	-12	-2	$10-12$
	-11	-1	$10-11$
	-10	0	$10-10$
	-9	1	$10-9$
	-8	2	$10-8$
	-7	3	$10-7$
	-6	4	$10-6$
	-5	5	$10-5$
	-4	6	$10-4$
	-3	7	$10-3$
	-2	8	$10-2$
	-1	9	$10-1$
	0	10	10 ± 0
	1	11	$10+1$
	2	12	$10+2$
	3	13	$10+3$
	4	14	$10+4$
	5	15	$10+5$
	6	16	$10+6$
	7	17	$10+7$
	8	18	$10+8$
	9	19	$10+9$
	10		$10+10$
	11	21	$10+11$
	12	22	$10+12$
	13	23	$10+13$
	&c.	&c.	&c.

In the tablet in the margin, we have placed several different values of a, passing on from -13 through 0 to $+13$. The third column contains the several values of the fraction, as they result from supplying the values of x and a, and actually performing the operations. Thus, when $x=-5$, then $\frac{a^2-x^2}{a-x}=\frac{100-25}{10+5}=5$: again when $x=+5$, $\frac{a^2-x^2}{a-x}=\frac{100-25}{10-5}=15$. But when $x=10$, we have not placed the value of the fraction in this third column, because since both numerator and denominator then become $=0$, and the ciphers are of different orders, we must have recourse to some other method of ascertaining the quotient. Here then we go to the fourth column, which contains the several values of $a+x$, the universal and accurate algebraic representation of the quotient equivalent to the fraction proposed. We find the value of $a+x$ in this column exactly corresponding with the different values of the fraction obtained by actual division in the third column, in every instance given both above and below the case when x and a are both $=10$. Now surely we ought not to be accused of adopting any unfair or unwarrantable species of induction, that in this case as well as the others the value of the fraction is truly expressed by the algebraic representation $a+x$. We know not what magical influence may be hid under the symbol $=$, which should when this mark is placed between x and a cause the value of the proposed fraction to be absolutely unassignable, though it may be readily assigned in every other conceivable instance. The question, in fact, amounts to this: either we can perform the fundamental algebraical operations (as addition, multiplication, division, &c.) correctly and safely, without knowing the real numeral values of the characters employed (a, b, c, x, y, z, &c.); or we cannot. If we cannot, the boasted universality of algebra

is gone, we must abandon it altogether, and return to our arithmetic and geometry. But, if we can,—if, for example, we can affirm universally, that $\frac{a^2-x^2}{a-x}=a+x$, whatever a and x may be, *why then the sum of a and x will represent the quotient of a^2-x^2 divided by $a-x$, whatever be the relation subsisting between a and x. There is no alternative between admitting this and abandoning all that is useful and valuable in modern analysis.*

Should not this manner of considering the subject remove all the scruples of Mr. Woodhouse, and others who have adopted similar notions, we will endeavour to place it in another point of view. Let us conceive $y=\frac{a^2-x^2}{a-x}$, and let us construct a figure which shall exhibit the different values of y. Since y, or its equal $a+x$, has all its variations in a ratio of equality with those of x, (a being constant) it is manifest that the locus of this equation is a right line making an angle of 45° with the axis of the figure. Let mAMMM, &c. be such locus, (fig. 12. Pl. 68.) and draw the several ordinates pm, pm. PM, PM, &c. Now at the point P, where $x=0$, we have $y=a+x=10=$ PM; and AP being $=10$, the ordinates gradually diminish until at the point A, $a+x$, being $=10-10=0$, the ordinate vanishes, and the locus crosses the axis: when x becomes $-12,-14$, &c. the ordinate is truly expressed by $-2,-4$, &c. being found on the contrary side of the axis. But, to proceed with the increasing ordinates on the right hand part of the figure: when PP$=5$, 6, 7, 8, or 9 respectively, it is manifest that PM, the ordinate, becomes $=15$, 16, 17, 18, or 19 respectively; and when PP$=11$, 12, 13, 14, &c., the ordinate PM$=$ 21, 22, 23, 24, &c. Since then the different values of y, or the proposed fraction, are exhibited, and we trust fairly and accurately exhibited, by this figure, both in the cases when x is less than a, and when it is greater than a, we trust there will be no great impropriety in adopting the species of reasoning which is the foundation of the *differential method*, (and which is so admirably elucidated in prop. 87 of Hartley on Man) and thus determining the value of y in the particular case of $x=a$. By this method then we find the ordinate (which in the figure we have presumed to represent by a dotted line) $=\frac{19+21}{2}=21$, which is equivalent to $a+x$, and furnishes another reason for believing that the value of the vanishing fraction is truly assigned.

FRA'CTIONAL. *a.* (from *fraction.*) Belonging to a broken number (*Cocker*).

FRA'CTURE. *s.* (*fractura*, Latin.) 1. Breach; separation of continuous parts (*Hale*). 2. The separation of the continuity of a bone in living bodies (*Herbert*).

To FRA'CTURE. *v. a.* (from the noun.) To break a bone (*Wiseman*).

FRACTURE, in surgery, a rupture of a bone, or a solution of continuity in a bone when it is crushed or broken by some external cause. See SURGERY.

FRÆNULUM. The cutaneous fold, under the apex of the tongue, that connects the tongue to the infralingual cavity. It is sometimes, in infancy, so short as to prevent the child from sucking, when it is necessary to cut it, in order to give more room for the motion of the tongue.

FRÆNUM, or FRENUM, bridle, in anatomy, a name given to divers ligaments, from their office in retaining and curbing the motions of the parts they are fitted to.

FRÆNUM LINGUÆ, or *BRIDLE OF THE TONGUE*; *a membranous ligament, which* connects the tongue with the muscles about the fauces, and lower parts of the mouth. In some subjects the frænum runs the whole length of the tongue to the very tip; in which cases, if it were not cut, it has been erroneously supposed, that there would be no possibility of speech. See TONGUE-TIED.

FRÆNUM PENIS, a slender ligament, whereby the prepuce is tied to the lower part of the glans of the penis. Nature varies in the make of this part; it being so short in some, that unless divided it would not admit of perfect erection. There is also a kind of frænum, fastened to the lower part of the clitoris in women.

FRAGA, a town of Spain, in Arragon, with a handsome castle. It is strongly situated among the mountains, having the river Cinca before it. Lat. 41. 46 N. Lon. 0. 28 E.

FRAGA'RIA. Strawberry. In botany, a genus of the class icosandria, order polygynia. Calyx ten-cleft, inferior; petals five; seeds smooth, imbedded in an ovate berry-like fleshy receptacle. Seven species—two of America, one somewhat shrubby; the rest natives of Europe; two of which, F. vesca, common strawberry, and F. sterilis, barren of fruit, are common to our own country.

The common strawberry is the only species cultivated for use; and its varieties are very numerous. The following are the chief:

α F. sylvestris, wood strawberry.
β F. virginiana. Virginian scarlet.
γ F. moschatta. Hautboy, or musky strawberry.
δ F. Chiloensis. Chili, or Carolina.
ε F. alpina. Alpine, or monthly.

The mode of cultivation in respect to all the species and varieties does not differ essentially. They may be transplanted in September or February: the former is the best month; for if the spring be dry, the February transplantation will require great attention and much watering. The proper soil is a light loam, and not peculiarly rich. The ground must be well dug and cleared of all noxious weeds; and when levelled it should be marked out into beds about three feet and a half wide, leaving a pathway between each bed two feet broad. In each of these beds should be planted four rows of plants, so that they may stand about a foot distant from each other in the rows, and at about eight inches plant from plant in each. This is the proper distance for the wood strawberry, which is of the least growth of any; but the scarlet strawberry must be planted at a foot distance every way, and the hautboy sixteen inches; and finally, the large Chili strawberry, which is the largest grower of all, must be set at twenty-two

inches distant plant from plant. In the spring, when the strawberries begin to flower, if the season be dry, they must be very plentifully watered, and kept cleared from weeds. At Michaelmas the beds should be dressed, the weeds all very carefully taken up, all the strings or runners taken from the roots, and the weak plants, which stand too close, be pulled up; a little fine earth, at the same time, should be thrown near the plants, which will greatly strengthen their roots. These beds, however, will not continue good above three years; and the beds of the first year bearing but few fruit, it is necessary to new plant some fresh ground every third year, and destroy the old beds; but the new ones must be first of one year's growth. Different palates prefer different sorts of strawberries, but the white-fruited one is, of all others, the best flavoured; though it is but a very bad bearer. The great Chili strawberry is cultivated in the field in that country; it is a much stronger and larger plant than any of our indigenous kinds, and its fruit is as large as a walnut, but not so well tasted as our own strawberries. They grow best in a loamy soil, under the shade of trees.

FRA'GILE. *a.* (*fragile*, French; *fragilis*, Latin.) 1. Brittle; easily snapped or broken (*Denham*). 2. Weak; uncertain; easily destroyed (*Milton*).

FRAGI'LITY. *s.* (from *fragile.*) 1. Brittleness; easiness to be broken (*Bacon*). 2. Weakness; uncertainty (*Knolles*). 3. Frailty; liableness to fault (*Wotton*).

FRA'GMENT. *s.* (*fragmentum*, Latin.) A part broken from the whole; an imperfect piece (*Newton*).

FRA'GMENTARY. *a.* (from *fragment.*) Composed of fragments: not used (*Donne*).

FRA'GOR. *s.* (Latin.) A noise; a creak; a crash: not used (*Sandys*).

FRA'GRANCE. FRA'GRANCY *s.* (*fragrantia*, Latin.) Sweetness of smell; pleasing scent; grateful odour (*Garth*).

FRA'GRANT. *a.* (*fragrans*, Latin.) Odorous; sweet of smell (*Prior*).

FRA'GRANTLY. *ad.* With sweet scent.

FRAIL. *s.* 1. A basket made of rushes. 2. A rush for weaving baskets.

FRAIL. *a.* (*fragilis*, Latin.) 1. Weak; easily decaying; subject to casualties; easily destroyed (*Rogers.*) 2. Weak of resolution; liable to errour or seduction (*Taylor*).

FRAI'LNESS. *s.* Weakness; instability (*Nor.*)

FRAI'LTY. *s.* (from *frail.*) 1. Weakness of resolution; instability of mind; infirmity (*Milton.*) 2. Fault proceeding from weakness; sins of infirmity (*Dryden*).

FRAI'SCHEUR. *s.* (French.) Freshness; coolness (*Dryden*).

FRAISE. *s.* (French.) A pancake with bacon in it.

FRAISE, in fortification, a kind of defence, consisting of pointed stakes, six or seven feet long, driven parallel to the horizon into the retrenchments of a camp, a half-moon, or the like, to prevent any approach or scalade.

Fraises differ from palisades chiefly in this, that the latter stand perpendicular to the horizon, or nearly so, being usually made a little sloping, or with the points hanging down. Fraises are chiefly used in retrenchments and other works thrown up of earth; sometimes they are found under the parapet of a rampart, serving instead of the cordon of stone used in stone-works.

FRAMBŒSIA, (*frambœsia*, from *framboise*, French for a raspberry.) The yaws. A genus of disease arranged by Cullen in the class cachexiæ, and order impetigines. It is somewhat similar in its nature to the lues venerea, and is endemial to the Antilla islands. It appears with excrescences, like mulberries, growing out of the skin in various parts of the body, which discharge an ichorous fluid.

Some of our best and most approved writers upon this subject, however, assign it to the family of fevers, with the general symptoms of which they affirm it is always accompanied; that like the small pox, it has an accession, height and decline, may be propagated by inoculation, and is never known to occur a second time.

To FRAME. *v. a.* 1. To form or fabricate by orderly construction (*Spenser*). 2. To fit one to another (*Abbot*). 3. To make; to compose (*Shakspeare*). 4. To regulate; to adjust (*Tillotson*). 5. To form any rule or method by study or precept (*Shakspeare*). 6. To form and digest by thought (*Granville*). 7. To contrive; to plan (*Clarendon*). 8. To settle; to scheme out (*Shakspeare*). 9. To invent; to fabricate (*Bacon*).

FRAME. *s.* (from the verb.) 1. A fabric; any thing constructed of various parts or members (*Tillotson*). 2. Any thing made so as to enclose or admit something else (*Newton*). 3. Order; regularity; adjusted series or disposition (*Swift*). 4. Scheme; order (*Clarendon*). 5. Contrivance; projection (*Shakspeare*). 6. Mechanical construction. 7. Shape; form; proportion (*Hudibras*).

FRAME, among painters, a kind of square, consisting of four long slips of wood joined together, whose intermediate space is divided by threads into several little squares like a net; and hence sometimes called *reticula*. It serves to reduce figures from great to small; or, on the contrary, to augment their size from small to great.

FRA'MER. *s.* (from *frame*; ꝼꞃemman, S.) Maker; former; contriver; schemer (*Arb*).

FRAMING OF A HOUSE, all the timber-work therein, viz. the carcase, flooring, partitioning, roofing, cieling, beams, &c.

FRAMLINGHAM, a large town of Suffolk, with a market on Saturday. It is seated near the head of a small rivulet, and has the remains of a castle, said to have been built in the time of the Saxon heptarchy. To this castle the princess Mary, afterward Mary I. retired, when lady Jane Grey was proclaimed queen; and here she found that powerful support of the people of Suffolk, which so soon

seated her on the throne. Here is also a stately church, in which are the monuments of some noble families. It is 30 miles E. of Bury, and 87 N. E. of London. Lon. 1. 26 E. Lat. 52. 25½N.

FRANCE, a country of Europe, bounded on the N. by the English Channel, and the Austrian Netherlands; on the E. by Germany, and the Alps, which separated it from Switzerland, Savoy, and Piedmont; on the S. by the Mediterranean sea and Spain, from which kingdom it is divided by the Pyrenees; and the W. by the Atlantic ocean; extending from 5. 5 W. to 7. 47 E. lon. and from 42. 30 to 51 N. lat. From the Pyrenees in the S. to Dunkirk in the N. its extent is 625 miles, and something more from the most easterly part of Alsace to the most western part of Brittany; which province, it must be observed, extends above 100 miles farther into the ocean than any other part of the country. The climate is temperate; the air pure and wholesome; and the soil, which is agreeably diversified, produces all the necessaries of life, and, among its luxuries, some of the most excellent wines. The principal rivers are the Seine, Loire, Rhone, and Gironde, with many others, that give name to the new geographical division of this country into departments. The most considerable mountains, besides the Alps and Pyrenees, are those of the Cevennes and Auvergne. France was lately an absolute monarchy, and was divided into several military governments, or provinces. These were Alsace, Angoumois, Anjou, Armagnac, Artois, Aunis, Auvergne, Barrois, Basques, Bearn, Berry, Bigorre, Blasois, Boulonnois, Bourbonnois, Bresse, Brittany, Burgundy, Cambresis, Champagne, Couseraus, Dauphiny, Forez, Foix, Franche Comté, French Flanders, Gascony, Gevaudan, Guienne, French Hainault, Isle of France, Languedoc, Limosin, Lorrain, Lyonois, Marche, Maine, Marsan, Navarre, Nivernois, Normandy, Orleanois, Perche, Perigord, Picardy, Poitou, Provence, Querci, Rouergue, Rousillon, Saintonge, Soissonnois, Touraine, Velay, and Vermandois. These varied much from each other in point of extent and importance, and there were others of still inferior consideration. The population of the whole is estimated by the French at 25,000,000. The established religion was the Roman Catholic; and the ecclesiastical division of the country was into 18 archbishoprics, and 113 episcopal sees, exclusive of Avignon, Carpentras, Caivaillon, and Vaison, which belonged to the pope.

The kingly government of France had continued from Clovis, who established himself at Soissons, in the year 486. Others call Pharamond the first king of France, who began to reign in the year 420. Hugh Capet obtained the crown of France in the year 987, and in the year 1793, on the 21st of January, Louis XVI. one of his descendants, was executed on a public scaffold at Paris, and with him ended the monarchy of France. All Europe exclaimed against the injustice and cruelty, not to say the impolicy, of this proceeding. The king's son, a minor, remained in prison to his death, which happened in the month of June, 1795. Thus France, after continuing a monarchy upwards of twelve hundred years, was by the national assembly declared a republic: with the fall of monarchy, or indeed before, all titles of nobility were abolished; and all ecclesiastical domains, such as abbies, monasteries, convents, &c. were decreed national property; all tithes were abolished; the revenues of the higher orders of the clergy reduced, and the number lessened; annuities were granted to the professed; and to the parochial clergy a provision was granted, moderate, but perhaps superior to what they had before received as vicars. The ancient division into provinces was also, by a solemn decree of the nation, changed into that of 83 departments; these were subdivided into districts, cantons, and municipalities. The names of the departments are Ain, Aisne. Allier, Alps Upper, Alps Lower, Ardeche, Ardennes, Arriege, Aube, Ande, Aveiron, Calvados, Cantal, Charente, Charente Lower, Cher, Correze, Corsica, Côte d'Or, Cotes du Nord, Creuse, Dordogne, Doubs, Drome, Eure, Eure and Loire, Finisterre, Gard, Garonne Upper, Gers, Gironde, Herault, Indre, Indre and Loire, Isere, Isle and Vilaine, Jura, Landes, Loir and Cher, Loire Upper, Loire Lower, Loiret, Lot, Lot and Garonne, Lozere, Maine, Maine and Loire, Manche, Marne, Marne Upper, Meurthe, Meuse, Morbihan, Moselle Nord, Nievre, Oise, Orne, Paris, Pas de Calais, Puy de Dome, Pyrenees Upper, Pyrenees Lower, Pyrenees Eastern, Rhine Upper, Rhine Lower; Rhone, Bouches du; Rhone and Loire, Saone Upper, Saone and Loire, Sarte, Seine and Oise, Seine Lower, Seine and Marne; Sevres, les deux; Somme, Tarn, Var, Vendee, Vienne Upper, Vosges, and Yonne. Each of these departments has an archiepiscopal or episcopal town. In the year 1793, the old calendar, with the observance of Sundays and holidays, was abolished, and a new calendar formed. (See CALENDAR). It may be remarked, however, that in 1802, under the government of Bonaparte, the observance of Sundays and some holidays was again established; and some alterations were made in the state of the clergy. But as there is no great appearance of permanence in the religious system now *adopted* by the French, we shall not enter into a detail of their present laws and observances. Suffice it to say, that in 1804 Bonaparte was made *Emperor* of France; that since that period he has restored titles of dignity and honour with which to reward his generals and great men, he has subjugated greater part of the continent of Europe, and placed his brothers and other relatives upon thrones; and that thus, after a long train of successes, with very little that can have been called a reverse of fortune, he has placed himself at the head of the European continent, where he enthrones and dethrones kings, makes and unmakes popes, at his plea-

sure, and has brought the people of France under a more complete despotism than they were *previous to the revolution of 1789. Depradt, in his work on the State of the Cultivation of France*, states that one half of the French territory is arable; or that, out of 131,000,000 of acres, 66,000,000 are cultivated with grain: but then it is to be remarked that more than one half of the grain is rye, or corn even inferior to rye. That which may be pronounced good land does not exceed 28,000,000 of acres. The same writer informs us that "the territory of France is perhaps the best in Europe, the richest in point of soil, the most varied in respect of productions, and equally removed from the extremes of heat and cold. There is not in all Europe a tract of land of equal size, which can bear a comparison with that which extends from Calais to the Loire, from the heights of Nantes, Orleans, and Nanci, to Mayence. The part most desirable to inhabit is that which is included between the Loire, the Rhone, the Rhine, and the sea. Its northern districts are not so cold as Sweden, nor so humid as Holland; and its southern provinces are not burnt up like those of Spain and Italy. In short, France has been treated by nature as if she were her eldest daughter." The reader will make some allowance for the exaggerations of this author, who seems warmly attached to his native soil. It must also be recollected that the French are very defective both in agricultural science and practice. With these allowances Depradt's account may assist in forming an estimate of the soil and climate of France. Here are mines of iron, lead, and copper; there are likewise some of silver and gold, but the last are not rich enough to defray the expences of working. The chief productions of France, for exportation, are wines, as Champagne, Burgundy, claret, &c. brandy, vinegar, fruit, such as prunes and prunelloes, dried grapes, pears, apples, oranges, and olives; corn, salt, hemp, flax, silk, resin, oil, soap, cork, kid-skins, perfumes, drugs, &c. The manufactures are silks, such as lustrings, modes, brocades, velvets, &c. woollen cloth, linen coarse and fine, lace, paper, china, of exquisite beauty and fineness, soap, &c. The French have for some years past obtained the secret from Spain of making Castile soap, as it is called, and have very large manufactures both at Marseilles and Toulon, and have thereby deprived the Spaniards of that valuable branch of trade. Nor is this the only benefit the French receive by this manufacture; for as one of the chief ingredients of making this soap is Levantine olive oil, their large sale for their soap gives them the advantage of constant back-freights from the Levant with these oils; which, it seems, has proved one means of the French advancing their Turkey trade upon the ruin of the English. The arts and sciences have always been encouraged in France; and if there can be *any* pleasure derived from the contemplation of the melancholy picture which the history of the last 20 years of this unhappy country presents, it must flow from the consideration that during all this cheerless period *the arts and sciences have never been entirely neglected, or forgotten; but that, on the contrary, they have been cultivated with an ardour* and success no where exceeded, nor any where equalled except in Britain.

France (Isle of), a late province of France, so called, because it was formerly bounded by the rivers Seine, Marne, Oise, Aisne, and Ourque. It now includes the four departments of Oise, Seine and Oise, Seine and Marne, and Paris.

France (Isle of), or Mauritius, an island in the Indian ocean, 200 leagues E. of Madagascar. It was early discovered by the Portuguese. After them, the Dutch settled on the S. E. shore, and gave it the name of Mauritius, in honour of prince Maurice, their stadtholder; but they abandoned it, on their acquisition of the Cape of Good Hope It then remained uninhabited, till the French landed there in 1720. This island is about 45 leagues in circumference. Indigo is the general object of cultivation; of which four or five crops a-year are produced. In 1789 one person only sent to Europe 30,000lb. weight of it, of a very superior quality. Attempts have been made to rear cochineal, as the island abounds with the plant on which the insects lie; but a small bird destroys the insect. The soil of this island is little superior to that at Port Jackson. The town and harbour are called Port Louis. The number of inhabitants on the island, exclusive of the military, is about 8,000 whites, and 12,000 blacks. Lat. 20. 0 S. Lon. 57. 28 E.

FRANCFORT ON THE MAINE, an ancient and free imperial city of Germany, in the circle of Franconia. This is one of the most commercial places in Europe, and has two great fairs every year. The chief structure is the town-house, in which is preserved the golden bull, the origin of the fundamental laws of the empire, and here is the chamber in which the emperor is elected. All religions are tolerated here, under certain restrictions; but Lutheranism is the established faith. The principal church is in the possession of the Roman catholics. The Jews are compelled to live together in a long narrow street, separated from the other citizens by a high wall, and at a certain hour of the night both ends of this street are shut up. Lat. 49. 55 N. Lon. 8. 40 E.

Francfort on the Oder, a town of Germany, in the circle of Upper Saxony, and Middle Mark of Brandenburg, with an university, founded in the year 1506, by the elector Joachim, and his brother Albert; composed of Calvinist professors. It has besides a noble academy, a society for the promoting of arts and sciences, two colleges, two fauxbourgs, and several churches. Lat. 52. 23 N. Lon. 14. 39 E.

FRANCHE COMTE, a province of France, before the revolution, and anciently a part of the kingdom of Burgundy. It is now divided into the three departments of Mount Jura, the Doubs, and Upper Saône.

FRANCHISE, in law. Franchise and *liberty some use as synonymous terms; and their definition is,* "a royal privilege, or branch of the king's prerogative, subsisting in the hands of a subject." Being therefore derived from the crown, they must arise from the king's grant; or, in some cases, may be held by prescription, which, as has been frequently said, presupposes a grant. The kinds of them are various, and almost infinite. We shall here briefly touch upon some of the principal; premising only, that they may be vested in either natural persons or bodies-politic; in one man, or in many: but the same identical franchise, that has before been granted to one, cannot be bestowed on another; for that would prejudice the former grant. To be a county-palatine, is a franchise vested in a number of persons. It is likewise a franchise for a number of persons to be incorporated and subsist as a body-politic; with a power to maintain perpetual succession, and do other corporate acts: and each individual member of such corporation is also said to have a franchise or freedom. Other franchises are, to hold a court-leet: to have a manor or lordship; or, at least, to have a lordship paramount: to have waifs, wrecks, estrays, treasure-trove, royal fish, forfeitures, and deodands: to have a court of one's own, or liberty of holding pleas and trying causes: to have the cognizance of pleas; which is a still greater liberty, being an exclusive right, so that no other court shall try causes arising within that jurisdiction: to have a bailiwick, or liberty exempt from the sheriff of the county; wherein the grantee only, and his officers, are to execute all process: to have a fair or market; with the right of taking toll, either there or at any other public places, as at bridges, wharfs, or the like; which tolls must have a reasonable cause of commencement (as in consideration of repairs, or the like,) else the franchise is illegal and void: or lastly, to have a forest, chase, park, warren, or fishery, endowed with privileges of royalty. See CHASE, FOREST, &c.

FRANCHISE is also used for an asylum or sanctuary, where people are secure of their persons, &c. Churches and monasteries in Spain are franchises for criminals; so were they anciently in England, till they were abused to such a degree that there was a necessity for abolishing the custom. One of the most remarkable capitulars made by Charlemagne in his palace of Heristal, in 779, was that relating to the franchises of churches. The right of franchise was held so sacred, that even the less religious kings observed it to a degree of scrupulousness; but to such excess in time was it carried, that Charlemagne resolved to reduce it. Accordingly he forbad any provision being carried to criminals retired into churches for refuge.

To FRANCHISE. *v. a.* (from the noun). To enfranchise, to make free.

FRANCIA (Francesco), a celebrated Bolognese painter, born in 1450. He was first a goldsmith or jeweller, afterwards a graver of coins and medals; but applying at last to painting, obtained great reputation by his works, particularly by a piece of St. Sebastian, whom he had drawn bound to a tree with his hands tied over his head. He pined himself into a consumption, by despairing to equal Raphael, and died in 1518.

FRANCIS (Philip), an ingenious divine. His father was a dean of the Irish church. The subject of the present notice was rector of Barrow in Suffolk, and chaplain to Chelsea hospital. He translated Horace and Demosthenes into English, and wrote two tragedies, Eugenia and Constantia. He died at Bath in 1773. His son was one of the supreme council at Bengal.

FRANCISCAN MONKS, FRIARS' MINOR, or GREY FRIARS, religious of the order of St. Francis, founded by him in the year 1209.

The rule of the Franciscans, as established by St. Francis himself, is briefly this: they are to live in common, to observe chastity, and to pay obedience to the pope and their superiors. Before they can be admitted into the order they are obliged to sell all they have, and give it to the poor: they are to perform a year's noviciate, and when admitted, never to quit the order on any account. They are to fast from the feast of All Saints to the Nativity. This order has produced four popes, forty-two cardinals, and an infinite number of patriarchs. The Franciscans had sixty-three monasteries in England, one of which was in the parish of St. Nicholas in London. It is said this order possessed (before the French revolution) 40,000 monasteries, hermitages, or chapels, in the different quarters of the globe.

FRANCK (Augustus Herman), a pious German divine, born at Lubeck in 1663. He was invited by the elector of Brandenburg into his dominions, and made at first professor of the Oriental languages at Halle, and afterwards of divinity. Here he laid the foundation of an orphan-house, which in 1727 had 2196 children, and more than 130 preceptors. He also projected and carried into effect a mission for propagating the gospel in Malabar. This great and good man died in 1727. His works are; 1. Sermons and Books of Devotion. 2. Methodus studii Theologici. 3. Introductio ad lectionem Prophetarum. 4. Commentatio de scopo librorum veteris & novi Testamenti. 5. Manuductio ad lectionem Scripturæ sacræ. 6. Observationes Biblicæ. Some of his practical books have been translated into English.

FRANCKLIN (Thomas), was born in 1720, and was the son of Richard Francklin, the printer of an anti-ministerial paper called *The Craftsman.* He was educated at Westminster school; from whence he went to the university of Cambridge, where he became fellow of Trinity-college, and was some time Greek professor. In Dec. 1758 he was instituted vicar of Ware and Thundridge; which, with the lectureship of St. Paul, Covent-Garden, and a chapel in Queen-street, were all the preferments he held till he obtained the

rectory of Brasted in Kent. This gentleman was possessed of no inconsiderable share of learning and poetical abilities, and was long a favourite in the literary world. His translations of Phalaris, Sophocles, and Lucian, equally evince his learning and his genius, as they are not more distinguished for fidelity in the version, than congeniality with the spirit of the admirable originals. Dr. Francklin, like Mr. Foote, suffered a translation from the French to be printed in his name; but the Orestes and Electra are supposed to be all that were really by him. It was a translation of Voltaire's works, to which also Dr. Smollet's name appears. His own dramatic compositions, of which the principal are the tragedies of the Earl of Warwick and Matilda, are universally known, and deservedly esteemed by the public; so that his death, which happened March 15, 1784, may be considered as a real loss to the republic of letters.

FRANCOIS (the abbé Laurent), a zealous antagonist of the French philosophers, born in 1698, and died in 1782. His works are; 1. A Treatise of Geography. 2. Proofs of the Religion of Jesus Christ, 4 vols. 3. Defence of Religion, 4 vols. 4. Examination of the Catechism of an honest Man. 5. Examination of the Facts on which Christianity is founded, 3 vols 12mo. 6. Observations on the Philosophy of History.

FRANCOIS (Cape), a town in the N. part of the island of St. Domingo. Lat. 19. 46 N. Long. 72. 18 W.

FRANCONIA, a circle of Germany; bounded on the north by Meissen and Thuringia, on the east by Bohemia and the Upper Palatinate, on the south by Bavaria and Suabia, and on the west by the Lower Palatinate and the electorate of Mentz. It is situate near the centre of Germany, the form inclined to a circle, whose diameter is about fifty leagues. In the centre the land is fertile in corn, wine, fruit, &c; but the frontiers are full of forests and mountains, and little cultivated. The principal river is the Maine. The inhabitants of many towns are Roman Catholics, though the principal part are Lutherans. The Calvinists have some churches, and the Jews some synagogues. At the division of 300,000 florins to the chest of the empire, this circle was rated at 22,698 florins. 47 kruitzers.

FRANEKER, a town of the United Provinces, in Friesland, with a castle, and a noted university. The public buildings are magnificent, and the town well watered by two canals. Lat. 53. 11 N. Lon. 5. 33 E.

FRA'NGIBLE. *a.* (*frango*, Latin.) Fragile; brittle; easily broken (*Boyle*).

FRA'NGULA. (*frangula*, from *frango*, to break, so called because of the brittleness of its branches.) Black alder. This officinal tree is the rhamnus frangula; inermis floribus monogynis hermaphroditis, foliis integerrimis of Linnéus. The berries and bark are used medicinally as strong purgatives. The former are often substituted for those of the buckthorn; the latter, which is the internal bark, and of a yellow colour, is mostly employed by the common people in dropsical and other disorders. See RHAMNUS.

FRANK. *s.* (from the adjective.) 1. A place to feed hogs in; a sty (*Shakspeare*). 2. A letter which pays no postage (*Pope*).

To FRANK. *v. a.* (from the noun.) 1. To shut up in a frank or sty (*Shakspeare*). 2. To feed high; to fat; to cram (*Ainsworth*). 3. To exempt letters from postage (*Swift*).

FRANK, or franc, meaning literally *free* from charges and impositions, or exempt from public taxes, has various significations in the ancient English customs.

FRANK ALMOIGN, signifies a tenure by spiritual service, where lands or tenements were held by an ecclesiastical corporation, sole or aggregate, to them and their successors, of some lord and his heirs, in free and perpetual alms.

FRANK FEE, signifies the same thing as holding lands and tenements in fee simple; that is, to any person and his heirs, and not by such service as is required by ancient demesne, but is pleaded at common law.

FRANK FERM, anciently signified lands charged in the nature of the fee by feoffment, &c. out of the knight's service for other certain yearly services.

FRANK FOLD, is where the lord has the liberty of folding his tenants' sheep within his manor.

FRANK LANGUAGE, or *lingua franca*, a kind of jargon spoken on the Mediterranean, and particularly throughout the coasts and parts of the Levant, composed of Italian, Spanish, French, vulgar Greek, and other languages.

FRANK LAW, a word applied to the free and common law of the land, or the benefit a person has by it.

FRANK MARRIAGE, is where a person, seised in fee of lands or tenements, has given them to another with his daughter, sister, or some woman otherwise of kin to him, in free marriage, by virtue of which the husband and wife have an estate in special tail, and shall hold the land of the donor, discharged of all services, except fealty, to the fifth degree.

FRANK PLEDGE, in our law, signifies a pledge or surety for the behaviour of freemen. According to the ancient custom of England, for the preservation of the public peace, every free-born man, at the age of 14, except religious persons, clerks, knights, and their eldest sons, was obliged to give security for his truth and behaviour towards the king and his subjects, or else be imprisoned. Accordingly, a certain number of neighbours became interchangeably bound for each other, to see each person of their pledge forthcoming at all times, or to answer for the offence of any one gone away; so that whenever any person offended, it was presently inquired in what pledge he was; and there the persons bound either produced the offender in 31 days, or made satisfaction for his offence.

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Frank. *a.* (*franc*, French.) 1. Liberal; generous; not niggardly (*Sprat*). 2. Open; ingenuous; sincere; not reserved. 3. Without conditions; without payment. 4. Not restrained; licentious (*Spenser*).

Frank, also denotes an ancient coin current in France: the frank was either of gold or silver, the first being worth something more than the gold crown, the latter, a third of the former. In the French new money they have retained the term *frank* or *franc*. Their three denominations are 10 *decimes*=1 *centime*; 10 *centimes*=1 *franc*; 1 *livre*=3 *deniers tournois*, of the old French money, or nearly 10½d. English money.

FRANKED LETTERS. The privilege of letters coming free of postage to and from members of parliament was claimed by the House of Commons in 1660, when the first legal settlement of the present post-office was made; but afterwards dropped, upon a private assurance from the crown, that this privilege should be allowed the members. Accordingly a warrant was constantly issued to the post-master-general, directing the allowance thereof to the extent of two ounces in weight: till at length it was expressly confirmed by 4 Geo. III c. 24. which added many new regulations, rendered necessary by the great abuses in the practice of franking; whereby the annual amount of franked letters had increased from 23,600l. in the year 1715, to 170,700l. in the year 1763. Other regulations afterwards took place; in particular, franks were required to be dated (the month written at length), and put into the office the same day; notwithstanding which, the revenue still lost by this privilege above 80,000l per annum. The following are the regulations of franking required by 35 Geo. III. and now in force.

No letter directed by or to any member of parliament shall be exempted from postage if it exceeds one ounce in weight. No letter directed by any member shall be exempted unless he shall actually be in the post-town, or within the limits of its delivery of letters, or within twenty miles of such post-town, on the day or on the day before the day, on which the letter shall be put into the office. No member shall be entitled to send free from postage more than ten letters in one day, nor to receive more than fifteen.

Whenever the number of letters sent or received by such members in one day shall exceed the number exempted, and the postage upon any of them shall differ, the letters chargeable with a higher postage shall be included in the number exempted, in preference to any chargeable with a lower postage, and the remainder shall be chargeable with the postage to which common letters are chargeable. Persons who may now in right of their offices send and receive letters free may continue so to do. Printed votes or proceedings in parliament, and printed newspapers, may also be sent as usual.

No single letter sent by the post from any non-commissioned officer, seaman, or private, in the navy, army, militia, fencible regiments, artillery, or marines, shall be charged with more postage than one penny, but the same must be paid at the time of putting the same into the post-office; and such letter must have written thereon, in the handwriting of and signed by the commanding officer, the name of such commanding officer, and of the ship, vessel, corps, regiment, or detachment. Also no single letter directed to any such non-commissioned officer, seaman, or private, shall be charged with more postage than one penny, to be paid on the delivery thereof; but such letter must be directed to such persons, specifying the ship, vessel, regiment, troop, corps, company, or detachment to which they belong: and the postmaster must deliver such letter either to the party to whom it shall be directed, or to some person appointed to receive the same by the commanding officer, and to no other.

Every cover containing patterns or samples of goods, not exceeding one ounce, shall be charged only as a single letter, if sent open at the sides, and without any letter or writing therewith, other than the name of the person sending the same, the place of his abode, and the prices of the articles.

FRANKENDAL, a town of Germany, in the palatinate of the Rhine. Lat. 49. 25 N. Lon. 8. 29 E.

FRANKENHAUSEN, a town of Upper Saxony, with some extensive salt-works. Lat. 50. 42 N. Lon. 11. 5 E.

FRANKENIA. Sea-heath. In botany, a genus of the class hexandria, order monogynia. Calyx five-cleft, funnel-form; petals five; stigmas three; capsule one-celled, three-valved. Four species, one a native of the Cape, one of Siberia, and two common to the salt marshes of our own country: they are not cultivated in our gardens.

FRANKFORT BLACK, is the chief ingredient in the copper-plate printer's ink; it is made of the lees of wine, burnt, washed in water, and ground in mills, together with ivory, or the stones from peaches and other fruit. The best is that made at Frankfort on the Maine, though a great deal is made at Mentz, Strasburgh, and different parts of France.

FRANKINCENSE. See Thus.

Frankincense tree. See Pinus.

Frankincense (Jews.) See Styrax.

FRANKLAND'S ISLANDS, a cluster of islands in the N. E. coast of New Holland, in the S. Pacific ocean. Lat. 17. 19 S. Lon. 146° E.

FRA'NKLIN. *s.* (from *frank.*) A steward, or bailiff of land: not in use.

Franklin (Benjamin), a celebrated American philosopher and politician, was born at Boston in New England, in 1706. His father was a soap-boiler and tallow-chandler in that town, and intended him for the same business; but conceiving a disgust to it, he was bound apprentice to one of his brothers, who was a printer. He did not serve out his time, owing to some quarrels between him and his brother, but withdrew privately to New York in 1723,

From thence he proceeded to Philadelphia in quest of employment. Here he was hired by one Keymer; and in 1724 he sailed for England, encouraged so to do by Sir William Keith, the governor of Pennsylvania, who promised to send letters of recommendation, and to furnish him with money sufficient to buy a press and other materials for printing. In this, however, he was disappointed. He continued in England about two years, working both as a pressman and compositor, and then returned to Philadelphia, where for a short time he served a merchant as book-keeper, and on the death of his employer, he returned to his former business under Mr. Keymer. It was not long, however, before he set up for himself, in partnership with a young man of the name of Meredith. In 1729 this partnership was dissolved, and Franklin thenceforward carried on the business by himself, with great advantage. The year following he married a lady, to whom he had paid his addresses before his departure for England. Owing to his having slighted her, she had married another person, and on becoming a widow, Mr. Franklin renewed his addresses and married her. He now became a public man; his abilities began to be generally known, and in consequence he was appointed successively to the offices of printer to the house of assembly, clerk to the general assembly of Philadelphia, and post-master, and at length he was elected a member of the general assembly of Philadelphia. In 1757 he came to England as agent for the province of Pennsylvania, and while here was honourably entertained by the most eminent persons in the philosophical world, on account of the improvements which electricity had received from him. He remained in England five years, and returned to America in 1762, where he received public thanks for his faithful services. In 1764 he lost his seat in the assembly of Philadelphia, and the same year returned to England. In 1766 he was examined at the bar of the House of Commons, relative to the state of America. Franklin remained in Europe till 1775, and then returned to his native land, having first endeavoured in vain to dissuade the ministry from their coercive measures. His fame stood as high in the political, as it had hitherto done in the scientific world. He became an active member of the new legislative assembly, and America is indebted for the formation of its constitution to this virtuous and enlightened philosopher. After this important service, he was sent as ambassador to France, to negociate an alliance with that country, in which he was successful. He also acted as one of the plenipotentiaries for his country in signing the treaty of peace with England, in 1783. He returned again to America in 1785, and received from his grateful countrymen those honours and distinctions which he had so justly merited.

His memory was very tenacious to the last; and he seemed to be an exception to the general rule, that at a certain period of life, the organs which are subservient to memory become callous; a remarkable instance of which is, that he learned to speak French after he had attained the age of 70. About 16 days before his death, he was seized with a feverish disorder; which, about the third or fourth, was attended with a pain in the left breast. This became at last very acute, and was accompanied with a cough and laborious breathing. Thus he continued for five days, when the painful symptoms ceased at once, and his family began to flatter themselves with hopes of his recovery. But a new imposthume had now taken place in the lungs; which suddenly breaking as the others had done, he was unable to expectorate the matter fully. Hence fatal symptoms arose, and he expired on the 17th of April, 1790. He left one son, governor William Franklin, a zealous loyalist, who afterwards resided in London; and a daughter, married to Mr. William Bache, merchant in Philadelphia. This lady was his greatest favourite, and waited upon him during his last illness.

With regard to the character of Dr. Franklin, he was said to be sententious, but not fluent in society; rather inclined to listen than to talk; an informing rather than a pleasing companion; very impatient, however, of interruption; so that he would frequently mention the custom of the Indians, who keep silence for some time before they answer a question which they have heard with attention. With regard to religion, he was a firm believer in the scriptures; and his sentiments on death may be gathered from a letter written about 35 years ago, to Miss Hubbard, on the death of her father-in-law Mr. John Franklin. The doctor was author of many tracts on electricity, and other branches of natural philosophy, as well as on politics and miscellaneous subjects.

Franklin, a county of Pennsylvania, 30 miles long, and 24 broad. Chambersberg is the capital.

FRA'NKLY. *ad.* (from *frank.*) 1. Liberally; freely; kindly; readily (*Bacon*). 2. Without constraint (*Clarendon*). 3. Without reserve (*Clarendon*).

FRA'NKNESS. *s.* (from *frank.*) 1. Plainness of speech; openness; ingenuousness (*Clarendon*). 2. Liberality; bounteousness. 3. Freedom from reserve (*Sidney*).

FRANKS, Francs, Frankis, or Franquis, a name which the Turks, Arabs, Greeks, &c. give to all the people of the western parts of Europe. The appellation is commonly supposed to have had its rise in Asia, at the time of the croisades; when the French made the most considerable figure among the croisées: from which time the Turks, Saracens, Greeks, Abyssinians, &c. used it as a common term for all the Christians of Europe; and called Europe itself *Frankistan.*

FRA'NTIC. *a.* (corrupted from *phrenetic.*) 1. Mad; deprived of understanding by violent madness (*Spenser*). 2. Transported by violence of passion; outrageous; turbulent (*Ad.*).

FRA'NTICLY. *ad.* Madly; distractedly; outrageously (*Shakspeare*).

FRA'NTICNESS. *s.* (from *frantic.*) Madness; fury of passion; distraction.

FRASCATI, a town of Italy, in the state of the Church and Campagna di Roma, the see of a bishop, who is a cardinal, and depends immediately on the pope; celebrated for the number of palaces and country seats of Italian princes and cardinals, in which are found most beautiful paintings and sculptures. Here are seven convents. It was the ancient Tusculum, destroyed by the Romans in the year 1191: ten miles S. E. Rome. Lat. 41. 46 N. Lon. 13. 56 E.

FRATE'RNAL. *a.* (*fraternel*, French. Brotherly; pertaining to brothers; becoming brothers (*Hammond*).

FRATE'RNALLY. *ad.* In a brotherly manner.

FRATE'RNITY. *s.* (*fraternité*, French.) 1. The state or quality of a brother. 2. Body of men united; corporation; society; association; brotherhood (*L'Estrange*). 3. Men of the same class or character (*South*).

FRATRICELLI, in ecclesiastical history, an enthusiastic sect of Franciscans, which rose in Italy, and particularly in the marquisate of Ancona, about the year 1294. The word is an Italian diminutive, signifying *fraterculi*, or little brothers; and was here used as a term of derision, as they were most of them apostate monks, whom the Italians call *fratelli*, or *fratricelli*. For this reason the term *fratricelli*, as a nick-name, was given to many other sects, as the Cathatists, the Waldenses, &c. however different in their opinions and in their conduct. But this denomination applied to the austere part of the Franciscans was considered as honourable. See FRANCISCANS.

The founders were P. Maurato, and P. de Fossombroni, who having obtained of pope Celestin V. a permission to live in solitude, after the manner of hermits, and to observe the rule of St. Francis in all its rigour, several idle vagabond monks joined them, who, living after their own fancies, and making all perfection to consist in poverty, were soon condemned by pope Boniface VIII and his successor, and the inquisitors ordered to proceed against them as heretics: which commission they executed with their usual barbarity.

FRA'TRICIDE. *s.* (*fratricide*, French.) The murderer of a brother.

FRAUD. *s.* (*fraus*, Latin; *fraude*, Fr.) Deceit; cheat; trick; artifice; subtilty; stratagem (*Dryden*).

FRA'UDFUL. *a.* (*fraud* and *full.*) Treacherous; artful; trickish; subtle (*Shakspeare*).

FRA'UDFULLY. *ad.* Deceitfully; artfully; subtilly; by stratagem.

FRA'UDULENCE. FRA'UDULENCY. *s.* (*fraudulentia*, Latin.) Deceitfulness; trickishness; proneness to artifice (*Hooker*).

FRAU'DULENT. *a.* (*fraudulentus*, Lat.) 1. Full of artifice; trickish; subtle; deceitful (*Milton*). 2. Performed by artifice; deceitful; treacherous (*Milton*).

FRA'UDULENTLY. *ad.* By fraud; by deceit; by artifice; deceitfully (*Taylor*).

FRAUGHT. *part. pass.* (from *fraight*, now written *freight.*) 1. Laden; charged (*Shakspeare*). 2. Filled; stored; thronged (*Addison*).

FRAUGHT. *s.* A freight; a cargo (*Dryden*).

To FRAUGHT. *v. a.* To load; to crowd (*Shakspeare*).

FRA'UGHTAGE. *s.* Lading; cargo (*Shakspeare*).

FRAXINELLA. (*fraxinella*, from *fraximus*, the ash, so called because its leaves resemble those of the ash.) See DICTAMNUS ALBUS.

FRAXIMUS. Ash-tree. In botany, a genus of the class polygamia, order diœcia. Hermaphrodite, calyxless, or four-parted; corolless, or four-petalled; stamens two; pistil one: capsule superior, flat, two-celled, leafy above; seeds few, pendulous. Fem. pistil one; lanceolate. Fifteen species: chiefly natives of North America, or the south of Europe; one species only common to our own country. This is the lofty ash, F. excelsior of Linnéus, with leaflets slightly petioled, lance oblong, serrate, tapering; flowers naked; capsules with an oblique emarginate tip. There is another variety with pendulous branches.

This species in our own country is of rapid growth, and may be planted with great advantage, the underwood, which may be successively cut every eight or ten years, paying alone the common rent of the land it occupies, while the plants left for timber will be fit for felling successively in twenty-three years, and will produce nearly 120l. sterling per acre. It grows best in society; it grows therefore rather thin when planted singly. The timber is hard and tough, and much used in agricultural tools. It does not commonly reach a large bore; yet there are instances of its having attained a circumference of fifty-eight feet in the trunk. It bears lopping and topping well; and in some parts of the country the lops and tops are given first of all to the cattle to eat off the bark, which supplies them with a nutritious food.

F. ornus is the beautiful flowering ash of our plantations. It is a native of the south of Europe; and as well as many other species of the fraximus produces the secretion called manna. F. rotundifolia, also a native of the south of Europe, yields the same kind of secretion; and so again does our own F. excelsior in warm climates. The seeds of this species, moreover, are occasionally employed as a diuretic. See MANNA.

FRAY. *s.* (*effrayer*, to fright, French.) 1. A battle; a fight (*Fairfax*). 2. A duel; a combat (*Denham*). 3. A broil; a quarrel (*Shakspeare*).

To FRAY. *v. a.* (*effrayer*, French.) 1. To fright; to terrify. 2. (*frayer*, French.) To rub.

FRAZERSBURGH, a seaport of Aberdeenshire. It is seated close by a promontory

called Kinnaird's Head, on which is a light-house. Lat. 57. 35 N. Lon. 1. 37 W.

FREA, FRIA, or FRIGGA, the wife of Odin, was, next to him, the most revered divinity among the Heathen Saxons, Danes, and other northern nations. As Odin was believed to be the father, Frea was esteemed the mother of all the other gods. In the most ancient times, Frea was the same with the goddess Hertha, or Earth, who was so devoutly worshipped by the Angli and other German nations.

FREAK. s. (ꝼꞃæc, Saxon.) 1. A sudden and causeless change of place. 2. A sudden fancy; a humour; a whim; a capricious prank (*Swift*).

To FREAK. *v. a.* To variegate (*Thomson*).

FRE'AKISH. *a.* (from *freak.*) Capricious; humoursome (*L'Estrange*).

FRE'AKISHLY. *ad.* (from *freakish.*) Capriciously; humoursomely.

FRE'AKISHNESS. *s.* (from *freakish.*) Capriciousness; humoursomeness; whimsicalness.

To FREAM. *v. n.* (*fremore*, Latin.) To growl or grunt as a boar (*Bailey*).

FREATS, or FREITS, a term used in Scotland for ill omens, and sometimes denoting accidents supernaturally unlucky. King James VI. in his Dæmonologie, MS. pen. Edit. B. I. chap. IV. p. 13. "But I pray you forget not likeways to tell what are the devill's rudiments? E. His rudiments I call first in generall all that quhilk is called vulgairelie the virtu of woode, herbe, and staine; quhilk is used by unlawful charmis, without natural causis. As lykeways ll kynd of prattiques, freitis, or uther lyk extraordinair actions, quhilk cannot abyde the trew twiche of naturall raison."

FRE'CKLE. *s.* (*flech*, a spot, German.) 1. A spot raised in the skin by the sun (*Dryden*). 2. Any small spot or discoloration (*Evelyn*).

FRE'CKLED. *a.* (from *freckle.*) Spotted; maculated (*Drayton*).

Persons of a delicate complexion, and particularly such as have naturally red hair, are most subject to *freckles* in the face and other parts exposed to the air. For the gratification of those who consider the removal of such little blemishes an object worthy of their attention, we shall communicate the following remedies:

According to Homberg, one of the best applications for dispersing freckles, is a mixture of bullock's gall with a solution of alum, which, after the latter has subsided, must be digested in the sun for three or four months in a close phial.—Another preparation is made by taking 4 oz. of lemon-juice, and mixing with it 2 drams of sugar, and one of borax, finely powdered; and after these ingredients have stood a week or fortnight in a glass bottle, the liquor will be fit for use.

FRE'CKLY. *a.* Full of freckles.

FRED. The same with peace. So *Frederick* is powerful or wealthy in peace (*Gibson*)

FREDENBURG, a town of Westphalia, in Germany. Lat. 51. 10 N. Lon. 8. 16 E.

FREDERICA, a town of Georgia, in North America. Lat. 31. 6 N. Lon. 80. 20 W.

FREDERIC I. king of Prussia. He was the son of Frederic-William the Great, elector of Brandenburg, and was born in 1657. In 1700 he entered into a negociation with the court of Vienna for the erection of Prussia into a kingdom, which, it is said, was obtained by an odd accident. When the affair was in no very promising train, the elector was advised by his minister, in a letter written in cypher, to use the interest of a certain prince; but the sense of the letter being mistaken, he, instead of the prince, had recourse to the emperor's father confessor, who was a jesuit, and so much struck was he with the honour done him by a protestant elector, that by his own interest, and that of his order, he quickly accomplished the wished-for object. In 1701 he was crowned king of Prussia, and was acknowledged as such by the emperor Leopold and all his allies. He augmented his dominions by the county of Tecklenburgh, and the principality of Neufchatel and Valengin. He died in 1713. This prince was magnificent and generous. He founded the university of Halle, the Royal Society of Berlin, and the academy of the nobles. (*Watkins*).

FREDERIC-WILLIAM II. king of Prussia, born at Berlin in 1688, and commenced his reign in 1713. He finished the negociation of peace in which his father was engaged at the time of his death. Not long afterwards he was engaged with other princes against Sweden, in which the confederates had the greatest success. He concluded a separate peace with that power, through the mediation of the king of Great Britain, in 1719, in consequence of which he obtained a considerable accession of territory. From that time to his death he preserved an uninterrupted peace. He died in 1740. Frederic married, in 1705, Sophia, daughter of the elector of Hanover, afterwards George I. king of England, (*Watkins*).

FREDERIC III. king of Prussia, the son of the preceding, was born in 1712. His father, who had no taste for polite literature, observed, with disgust, his son's inclination thereto, and in consequence treated him with severity. The prince ill brooking this behaviour resolved to escape, and at the age of 18 formed a plan accordingly, which was discovered, and he was thrown into prison; and his companion, a young officer, executed before his eyes. In 1733 he was married to the princess of Brunswic Wolfenbuttle, and some sort of reconciliation took place between him and his father. In 1740 he ascended the throne, and soon after began his ambitious career by demanding Silesia from Maria Theresa, queen of Hungary, whom he saw to be in a defenceless state. He obtained what he required by the treaty of Breslaw; but in 1744 he declared war against Maria Theresa, because she would not acknowlege the election of the emperor Charles VII. In this war Frederic experienced great success, and terminated it advantageously to himself, at the end of 1745. When war broke out be-

tween England and France, in 1755, each power formed a continental alliance, England with Prussia, and France with Austria. Frederic, without any provocation, at once marched into Saxony, upon which the States of the Empire declared war against him as a disturber of the common peace. In 1757 he was surrounded on all sides by the most powerful enemies. Russia, the German empire, the house of Austria, Saxony, Sweden, and France. His enemies entered into his dominions, and he experienced some signal defeats. But on the 5th of November, 1757, he obtained a great victory over the Austrians and French at Rosbach, and shortly after another over the Austrians near Breslaw, in consequence of which that city fell into his hands, with 15,000 prisoners. Thus he recovered all his losses, and his ally proving equally successful, an advantageous peace was concluded in 1763, in which the possession of Silesia was confirmed to him by the emperor. In 1772 he confederated with Russia and Austria in seizing upon the territories of that devoted country Poland. The remainder of his reign was devoted to the arts of peace; and he paid the greatest attention to the laws commerce, agriculture, and police, of his kingdom. He concluded a long, and it may be said a glorious reign, in 1786. Frederic was not only a warrior, but a writer. The works published in his life-time consist of four volumes in 8vo. The 1st volume contains his Anti-Machiavel; Military Instructions for the generals of his army; and his Correspondence with Foucquet. The 2d, his Memoirs of the House of Brandenburgh. The 3d, his Poems. And the last a Miscellaneous Collection of Pieces. His posthumous works were published at Berlin, in 15 vols. 8vo. the most considerable piece in which is the History of his own Times. Frederic was a lively writer, and had evidently modelled his style and sentiments upon those of Voltaire. The following account of his manner of life may be acceptable to the reader: His dress was very plain, and always military; his first employment when he arose, which was usually at five in the morning, was to read the memorials or petitions that were addressed to him by his subjects, for he permitted the lowest to write to him; he then marked on the back of each with a pencil what answer his secretary was to return. About 11 o'clock he went into the garden, and reviewed his regiment of guards. At 12 he dined, being generally accompanied by some of his officers. After dinner he retired to his study for two or three hours. At seven he attended a concert, in which he performed on the flute. The concert was followed by a supper, to which he usually invited some literary persons, and the conversation was suited to the party. His discipline was rigid; but as a monarch he was indulgent: and though a despotic prince his subjects were happy in his government. (*Watkins*).

FREDERIC (Colonel), the unfortunate son of the unfortunate Theodore king of Corsica. According to his own account, he was born in Spain, where his mother, who was of the noble family of Lucan, in Ireland, waited upon the queen. He followed his father, as he says himself, to share his misfortunes, and administer to his necessities. His education was very liberal, and with the most ample qualifications he entered upon a military life. On his first arrival in England, about 1754, he undertook to teach the Italian language, by which profession he subsisted for some years. By a German lady, whom he married abroad, he had two children, a son and a daughter; the son fell in North America, and the daughter is still living. After an absence of some months on the continent, he returned with the brevet rank of colonel from the late duke of Wurtemberg, also the cross of merit. He acted as the agent of that prince in England, and helped him to dispose of a regiment of his subjects to the India company. In 1791 he went to Antwerp to negociate for a loan for the prince of Wales, and some other branches of the royal family. The king, however, being dissatisfied with this measure, it came to nothing, much to the disadvantage of the negociator. His finances growing still more and more decayed, he took the fatal resolution of destroying himself, which he executed with a pistol at the gate of Westminster abbey, in the evening of February 1, 1796. He was a man of general knowledge, and polite manners; nor were his literary talents contemptible. He wrote, 1. Memoirs pour servir l'Histoire de Corse, 1768, 8vo. 2. The Description of Corsica, with an Account of its Union to the Crown of Great Britain, &c. 1798, 8vo.

FREDERICKSBURG, a castle and palace belonging to the king of Denmark, in the isle of Zealand. Lat. 55. 22 N. Lon 12. 25 E.

FREDERICKSHALL, or FREDERICKSTADT, a strong town of Aggerhuus, in Norway. Charles II, king of Sweden was killed here by a musket-ball in 1718. Lat. 59. 2 N. Lon. 10. 45 E.

FREDERICKSTADT, a town of South Jutland, in Denmark. Lat. 54. 30 N. Lon. 9. 53 E.

FREDERICSTOWN, a flourishing town of the United States, in Maryland, seated on the Potomac. Lat. 39. 20 N. Lon. 77. 30 W.

FREE. *a.* (ꝼreah, Saxon.) 1. At liberty; not enslaved (*Prior*). 2. Uncompelled; unrestrained (*South*). 3. Not bound by fate; not necessitated (*Milton*). 4. Permitted; allowed (*Shakspeare*). 5. Licentious; unrestrained (*Temple*). 6. Open; ingenuous (*Otway*). 7. Acquainted; conversing without reserve. 8. Liberal; not parsimonious (*Pope*). 9. Frank; not gained by importunity; not purchased (*Bacon*). 10. Clear from distress (*Shakspeare*). 11. Guiltless; innocent (*Dryden*). 12. Exempt (*Denham*). 13. Invested with franchises; possessing any thing without vassalage (*Dryden*). 14. Without expence: as a *freeschool*.

To FREE. *v. a.* 1. To be at liberty; to rescue from slavery; to manumit; to loose (*Pope*) 2. To rid from; to clear from any thing ill (*Clarendon*). 3. To clear from im-

pediments or obstructions (*Dryden*). 4. To banish; to send away: not used (*Shakspeare*). 5. To exempt (*Romans*).

FREE-BENCH, signifies that estate in copyhold which the wife, being espoused a virgin, has after the decease of her husband for her dower, according to the custom of the manor. In regard to this free-bench, different manors have different customs: and in the manor of East and West Enbourne in the county of Berks, and in other parts of England, there is a custom, that when a copyhold tenant dies, the widow shall have her free-bench in all the deceased husband's lands *dum sola et casta fuerit*, "whilst she lives single and chaste;" but if she is found to be guilty of incontinency, she shall forfeit her estate. Nevertheless, upon her coming into the court of the manor riding backwards on a black ram, with his tail in her hand, rehearsing a certain form of words, the steward is bound by custom to restore her to her free-bench. The words are,

Here I am,
Riding on a black ram,
Like a whore as I am;
And for my crincum craneum
Have lost my bincum bancum,
And for my tail's game
Have done this worldly shame:
Therefore, pray, Mr. Steward, let me have
my land again.

FREE, or IMPERIAL CITIES, in Germany, are those not subject to any particular prince, but governed, like republics, by their own magistrates.

FREEBO'OTER. *s.* (*free* and *booty*.) A robber; a plunderer; a pillager (*Clarendon*).

FREEBO'OTING. *s.* Robbery; plunder (*Spenser*).

FRE'EBORN. *a.* Inheriting liberty (*Dry.*).

FREECHA'PEL. *s.* (*free* and *chapel*.) A chapel of the king's foundation, and by him exempted from the jurisdiction of the ordinary. The king may also license a subject to found such chapel (*Cowell*).

FREE-CHAPEL, is also a name given to certain places of protestant worship, established of late years with a view to encourage among the poor a regular observation of the sabbath. In London and Bath these establishments have been found to answer excellent purposes.

Mr. Bernard, of Bath, proposes that a society be formed for promoting the foundation and establishment of free chapels for the poor, and the increase and improvement of their religious habits, within the realm of England: that every subscriber of fifty guineas in one sum, or of five guineas a-year, shall be a governor of the society; and that in case of a donation of 100 guineas or more, the donor shall, for every 50 guineas beyond what would constitute his own subscription, have the power of naming one life-governor: the specific appropriation of the funds being for the establishment and support of free-chapels for the poor, in the metropolis, and in any of the populous towns of England; subject, as all other chapels and churches of the established church must be, to episcopal control and government.

Whenever such a society shall be formed, and the directing power placed in unexceptionable hands, we may venture to hope that some addition to its funds may be afforded by government. It may also be expected, that, with a proper and economical application of those funds, every thousand pounds intrusted to the direction of it may afford the means of forming and establishing a new free-chapel for the poor, either in London, or in Manchester, Bristol, Norwich, or in some other of our most populous towns. What the effects may eventually and ultimately be, and what strength and stability it may give to the civil and ecclesiastical establishment of the country, and what renovation of vigour and force to the moral and religious habits of the poor, we leave to the reflection and appreciation of the reader. Our earnest wishes are in unison with those of this benevolent gentleman.

FRE'ECOST. *a.* Without expence; free from charges (*South*).

FRE'EDMAN. *s.* A slave manumitted (*Dryden*).

FRE'EDOM. *s.* (from *free*.) 1. Liberty; exemption from servitude; independence (*Dryden*). 2. Privilege; franchises; immunities (*Shakspeare*). 3. Power of enjoying franchises (*Swift*). 4. Exemption from fate, necessity, or predetermination (*South*). 5. Unrestraint (*Maccabees*). 6. The state of being without any particular inconvenience (*Law*). 7. Ease or facility in doing any thing.

FREEDOM OF A CORPORATION, the right of enjoying all the privileges and immunities belonging to it. (See CORPORATION.) The freedom of cities, and other corporations, is regularly obtained by serving an apprenticeship; but it is also purchased with money, and sometimes conferred by way of compliment.

FREEDOM OF CONSCIENCE. See TOLERATION.

FREEDOM OF THE WILL, that power or faculty of the mind, whereby it is capable of acting or not acting, choosing or rejecting whatever it judges proper. Of this every man must be sensible, who finds in himself a power to begin or forbear, continue or end several actions, barely by a thought or preference of the mind.

FREEFO'OTED. *a.* (*free* and *foot*.) Not restrained in the march (*Shakspeare*).

FREEHE'ARTED. *a.* (*free* and *heart*.) Liberal; unrestrained (*Davies*).

FREEHOLD, FRANK TENEMENT, *liberum tenementum*, is land or tenement which a man holds in fee-simple, fee-tail, or for term of life. (See FEE and TAIL.) Freehold is of two kinds, in deed and in law. The first is the real possession of land or tenement in fee, fee-tail, or for life: the other is the right a man has to such land or tenement before his entry or seizure. A freehold, by the common law, cannot commence in futuro; but it must take effect presently, either in possession, reversion, or remainder. Whatever is part of the

freehold goes to the heir; and things fixed thereto may not be taken in distress for rent, or in execution, &c. No man shall be disseised of his freehold by stat. Magna Charta, cap. 29. but by judgment of his peers, or according to the laws of the land: nor shall any distrain freeholders to answer for their freehold, in any thing concerning the same, without the king's writ. Freehold estates, of certain value, are required by statutes to qualify jurors, electors of the knights of the shire in parliament, &c.

FREEHOLD is likewise extended to such offices as a man holds in fee, or for life.

FREEHOLD is also sometimes taken in opposition to villenage. Lambard observes, that land, in the Saxon times, was distinguished into bockland, i. e. holden by book or writing; and folkland, held without writing. The former, he says, was held on far better conditions, and by the better sort of tenants, as noblemen and gentlemen; being such as we now call freehold: the latter was mostly in the possession of peasants; being the same with what we now call at the will of the lord. In the ancient laws of Scotland, freeholders are called *milites*, knights. In Reg. Judicial. it is expressed, that he who holds land upon an execution of a statute merchant, until he hath satisfied the debt, *tenet ut liberum tenementum sibi et assignatis suis*; and the same of a tenant *per eligit:* the meaning of which seems to be, not that such tenants are freeholders, but as freeholders for the time, till they have received profits to the value of their debt.

FREEHO'LDER. *s.* (from *freehold.*) One who has a freehold (*Davies*).

FRE'ELY. *ad.* (from *free.*) 1. At liberty; without vassalage; without slavery; without dependance. 2. Without restraint; heavily (*Shakspeare*). 3. Plentifully; lavishly (*Shakspeare*). 4. Without scruple; without reserve (*Pope*). 5. Without impediment (*Ascham*). 6. Without necessity; without predetermination (*Rogers*). 7. Frankly; liberally (*South*). 8. Spontaneously; of its own accord.

FRE'EMAN. *s.* (*free* and *man.*) 1. One not a slave; not a vassal (*Locke*). 2. One partaking of rights, privileges, or immunities (*Dryden*).

FREEMASON. See MASON, and MASONRY.

FREEMI'NDER. *a.* (*free* and *mind.*) Unperplexed; without load of care (*Bacon*).

FRE'ENESS. *s.* (from *free.*) 1. The state or quality of being free. 2. Opennesss; unreservedness; ingenuousness; candour (*Dryd.*). 3. Generosity; liberality (*Sprat*).

FREESCHO'OL. *s.* (*free* and *school.*) A school in which learning is given without pay (*Davies*).

FREESPO'KEN. *a.* (*free* and *spoken.*) Accustomed to speak without reserve (*Bacon*).

FREESTONE, a whitish stone, dug up in many parts of Britain, that works like alabaster, but is more hard and durable; being of excellent use in building, &c. It is a species of the grit stone, but finer sanded and smoother; and is called free, from its being of such a constitution as to allow of being cut freely in any direction.

The qualities of the several kinds of freestones used in the different parts of Europe are very different. They all agree in this general property indeed, that they are softer when in the quarry, than when they have been some time exposed to the air; but even this general property differs greatly in degree. They have a sort of grey freestone in use at Paris (of which we do not yet seem to have met with any in this country), which has the abovementioned quality in so great a degree, that the expence of working it is in a great measure saved.

This stone lies every where on the south side of the river Seine, and is of a coarse and large grit. It is so soft when newly taken out of the strata, that they fashion it very conveniently with a sort of broad axe, and form as many stones for building in this manner in an hour, as an equal number of our people do in a day or two. Though this stone is as soft as dry clay when first taken up, it is found to harden so considerably in the air, that it becomes more than equal to our ordinary freestone.

Our Portland stone of the finest kind, which is white, and of a close grit, is very fit for hewing and carving; but it will neither resist water nor fire, which is a very singular instance in so dense a stone; while the freestone of Kent, which is less beautiful to the eye, and is of a greyish colour, and considerably close, though of a larger grain, resists the air and water very well. The freestone of Derbyshire, on the other hand, is so brittle as to be unfit for any fine working; and so coarse and open in its texture, that it lets water through; yet it bears the fire extremely well, and is fit for ovens, hearths, &c.

FREETHI'NKER. *s.* (*free* and *think.*) A libertine; a contemner of religion (*Addison*).

FREE WARREN, a franchise or place distinct from forest, chace, park, manor, or warren, derived originally from the crown; and the person having a grant of such franchise or free warren possesses a sole right of pursuing, taking, and killing game of every kind within its limits: although not one acre of land belonging to it may be his own property through the whole district where manor lands are situate in, and surrounded by, a free warren, the owner of such lands may kill game within his own manor, but he cannot introduce even a qualified person to kill game there also, without the consent of the owner or possessor of the privilege of free warren over the whole.

FREEWI'LL. *s.* (*free* and *will.*) 1. The power of directing our own actions without restraint by necessity or fate (*Locke*). 2. Voluntariness; spontaneity (*Ezra*).

FREEWO'MAN. *s.* (*free* and *woman.*) A woman not enslaved (*Maccabees*).

To FREEZE. *v. n.* pret. *froze.* (*vriesen*, Dutch.) 1. To be congealed with cold (*Locke*). 2. To be of that degree of cold by which water is congealed (*Dryden*).

To **Freeze.** *v. a.* 1. To congeal with cold. 2. To kill by cold (*Shakspeare*). 3. To chill by the loss of power or motion.

Freeze, or **Frize**, in architecture, that part of the entablature of columns which is between the architrave and corniche. In the Tuscan order it is quite plain; in the Doric, enriched with triglyphs, or channelled figures, with spaces between them, called metopes, which are often plain, and sometimes ornamented; in the Ionic, it is sometimes made arched or swelled; in the Corinthian and Composite, it is frequently joined to the architrave, by a little sweep, and sometimes to the corniche: and in these richer orders it is usually adorned with sculpture, figures, compartiments, histories, foliages, festoons, &c.

FREEZING, in natural philosophy, congelation, the transformation of a fluid body into a firm or solid mass, by the action of cold; in which sense the term is applied to water when it freezes into ice; to metals when they resume their solid form after being melted by heat; or to glass, wax, pitch, tallow, &c. when they harden again after having been rendered fluid by heat.

The process of congelation is always attended with the emission of heat, as is found by experiments on the freezing of water, wax, spermaceti, &c.; for in such cases it is always found that a thermometer dipt into the fluid mass keeps continually descending as this cools, till it arrive at a certain point, being the point of freezing, which is peculiar to each fluid, where it is rather stationary, and then rises for a little, while the congelation goes on. But by what means it is that fluid bodies should thus be rendered solid by cold, or fluid by heat, or what is introduced into the bodies by either of those principles, are matters the learned have not yet been able to discover, or to satisfy themselves upon. The following phænomena however are usually observed.

Water, and some other fluids, suddenly dilate and expand in the act of freezing, so as to occupy a greater space in the form of ice than before, in consequence of which it is that ice is specifically lighter than the same fluid, and floats in it. And the degree of expansion of water, in the state of ice, is by some authors computed at about $\frac{1}{18}$ of its volume. Oil, however, is an exception to this property, and quicksilver too, which shrinks and contracts still more after freezing. Mr. Boyle relates several experiments of vessels made of metal, very thick and strong; in which, when filled with water, close stopped, and exposed to the cold, the water being expanded in freezing, and not finding either room or vent, burst the vessels. A strong barrel of a gun, with water in it close stopped and frozen, was rent the whole length. Huygens, to try the force with which it expands, filled a cannon with it, whose sides were an inch thick, and then closed up the mouth and vent, so that none could escape; the whole being exposed to a strong freezing air, the water froze in about 12 hours, and burst the piece in two places. Mathematicians have computed the force of the ice upon this occasion, and they say, that such a force would raise a weight of 27,720 pounds. Lastly, Major Edward Williams, of the royal artillery, made many experiments on the force of it, at Quebec, in the years 1784 and 1785. He filled all sizes of iron bomb-shells with water, then plugged the fuze-hole close up, and exposed them to the strong freezing air of the winter in that climate; sometimes driving in the iron plugs as hard as possible with a sledge hammer; and yet they were always thrown out by the sudden expansion of the water in the act of freezing, like a ball shot by gunpowder, sometimes to the distance of between 400 and 500 feet, though they weighed near three pounds; and when the plugs were screwed in, or furnished with hooks or barbs to lay hold of the inside of the shell by, so that they could not possibly be forced out, in this case the shell was always split in two, though the thickness of the metal of the shell was about an inch and three quarters. It is farther remarkable, that through the circular crack, round about the shells, where they burst, there stood out a thin film, or sheet of ice, like a fin; and in the cases when the plugs were projected by freezing water, there suddenly issued out from the fuze-hole a bolt of ice of the same diameter, and stood over it to the height sometimes of eight inches and a half. And hence we need not be surprised at the effects of ice in destroying the substance of vegetables and trees, and even splitting rocks, when the frost is carried to excess.

It is also observed that water loses of its weight by freezing, being found lighter after thawing again, than before it was frozen. And indeed it evaporates almost as fast when frozen as when it is fluid.

It is said too that water does not freeze in vacuo; requiring for that purpose the presence and contiguity of the air. But this circumstance is liable to some doubt, and it may be suspected that the degree of cold has not been carried far enough in these instances; as it is found that mercury in the vacuum of thermometers has even been frozen, though it requires a vastly greater degree of cold to freeze mercury than water.

Water which has been boiled freezes more readily than that which has not been boiled; and a slight disturbance of the fluid disposes it to freeze more speedily; having sometimes been cooled several degrees below the freezing point, without congealing when kept quite still, but suddenly freezing into ice on the least motion or disturbance.

Water, being covered over with a surface of oil of olives, does not freeze so readily as without it; and nut oil absolutely preserves it under a strong frost, when olive oil would not.

The surface of the water, in freezing, appears all wrinkled: the wrinkles being some-

times in parallel lines, and sometimes like rays, proceeding from a centre to the circumference.

The prodigious power of expansion evinced by water in the act of freezing is nearly double that of the most powerful steam-engines, and exerted in so small a mass, seemingly by the force of cold, was thought a very material argument in favour of those who supposed that cold, like heat, is a positive substance. Dr. Black's discovery of latent heat, however, has now afforded a very easy and natural explication of this phenomenon. He has shewn that, in the act of congelation, water is not cooled more than it was before, but rather grows warmer: that as much heat is discharged, and passes from a latent to a sensible state, as, had it been applied to water in a fluid state, would have heated it to 135°. In this process the expansion is occasioned by a great number of minute bubbles suddenly produced. Formerly these were supposed to be cold in the abstract; and to be so subtle, that insinuating themselves into the substance of the fluid, they augmented its bulk, at the same time that by impeding the motion of its particles upon each other, they changed it from a fluid to a solid. But Dr. Black shews, that these are only air extricated during the congelation; and to the extrication of this air he ascribes the prodigious expansive force exerted by freezing water. The only question, therefore, now remaining is, by what means this air comes to be extricated, and to take up more room than it naturally does in the fluid? To this it may be answered, that perhaps part of the heat, which is discharged from the freezing water, combines with the air in its unelastic state, and, by restoring its elasticity, gives it that extraordinary force, as is seen also in the case of air suddenly extricated in the explosion of gunpowder.

Cold also usually tends to make bodies electric, which are not so naturally, and to increase the electric properties of such as are so. And it is farther found, that all substances do not transmit cold equally well; but that the best conductors of electricity, viz. metals, are likewise the best conductors of cold. It may farther be added, that when the cold has been carried to such an extremity as to render any body an electric, it then ceases to conduct the cold so well as before. This is exemplified in the practice of the Laplanders and Siberians; where, to exclude the extreme cold of the winters from their habitations the more effectually, and yet to admit a little light, they cut pieces of ice, which in the winter time must always be electric in those countries, and put them into their windows: which they find to be much more effectual in keeping out the cold than any other substance.

Cold, or rather the absence of heat, is the destroyer of all vegetable life, when increased to an excessive degree. It is found that many garden plants and flowers, which seem to be very stout and hardy, go off at a little increase of cold beyond the ordinary standard. And, in severe winters, nature has provided the best natural defence for the cornfields and gardens, namely, a covering of snow, which preserves such parts green and healthy as are under it, while such as are uncovered by it are either killed or greatly injured.

Although the thermometer in this country hardly ever descends so low as 0, yet, in the winter of 1780, Mr. Wilson, of Glasgow, observed, that a thermometer laid on the snow sunk to 25° below 0; and Mr. Derham, in the year 1708, observed in England that the mercury stood within one tenth of an inch of its station when plunged into a mixture of snow and salt. At Petersburgh, in 1732, the thermometer stood at 28° below 0; and when the French academicians wintered near the polar circle, the thermometer sunk to 33 below 0; and in the Asiatic and American continents still greater degrees of cold are often observed.

The effects of these extreme degrees of cold are very surprising. Trees are burst, rocks rent, and rivers and lakes frozen several feet deep: metallic substances blister the skin like red hot iron: the air, when drawn in by breathing, hurts the lungs, and excites a cough: even the effects of fire, in a great measure, seem to cease: and it is observed, that though metals are kept for a considerable time before a strong fire, they will still freeze water when thrown upon them. When the French mathematicians wintered at Tornea, in Lapland, the external air, when suddenly admitted into their rooms, converted the moisture of the atmosphere into whirls of snow; their breasts seemed to be rent when they breathed it, the contact of it was intolerable to their bodies; and the spirit of wine, which had not been highly rectified, burst some of their thermometers by the congelation of the aqueous part.

Extreme cold too often proves fatal to animals in those countries where the winters are very severe: thus 7000 Swedes perished at once in attempting to pass the mountains which divide Norway from Sweden. But it is not necessary that the cold, in order to prove fatal to human life, should be so very intense as has been just mentioned; it is only requisite to be a little below 32° of Fahrenheit, or the freezing point, accompanied with snow or hail, from which shelter cannot be obtained. The snow which falls upon the clothes, or the uncovered parts of the body, then melts, and by a continual evaporation carries off the animal heat to such a degree, that a sufficient quantity is not left for the support of life. In such cases, the person first feels himself extremely chill and uneasy; he turns listless, unwilling to walk or use exercise to keep himself warm, and at last turns drowsy, sits down to refresh himself with sleep, but wakes no more.

With regard to the term congelation, it is applied to water when it freezes into ice; to

metals, when they resume their solid form after being melted by heat; or to glass, wax, pitch, tallow, &c. when they harden again after having been rendered fluid by heat. But it differs from crystallization, which is rather a separation of the particles of a solid from a fluid in which it had been dissolved more by the moisture than the action of heat.

FREEZING-POINT, denotes the point or degree of cold, shewn by a mercurial thermometer, at which certain fluids begin to freeze, or, when frozen, at which they begin to thaw again. On Fahrenheit's thermometer this point is at $+32$ for water, and at -40 for quicksilver, these fluids freezing at those two points respectively. It would also be well if the freezing points for other fluids were ascertained, and the whole arranged in a table. See THERMOMETER.

FREEZING-RAIN, or RAINING ICE, a very uncommon kind of shower, which fell in the west of England, in December, 1672, of which we have various accounts in the Philosophical Transactions. This rain, as soon as it touched any thing above ground, as a bough, &c. immediately settled into ice; and, by multiplying and enlarging of the icicles, broke all down with its weight. The rain that fell on the snow immediately froze into ice, without sinking in the snow at all. It made an incredible destruction of trees, beyond any thing in all history. "Had it concluded with some gust of wind (says a gentleman on the spot), it might have been of terrible consequence. I weighed the sprig of an ash-tree, of just three-quarters of a pound, the ice on which weighed 16 pounds. Some were frightened with the noise in the air, till they discerned it was the clatter of icy boughs, dashed against each other." This phenomenon, however, is not uncommon in a less degree, and depends wholly on the nice balance of temperatures in the rain and atmosphere. Dr. Beale observes, that there was no considerable frost observed on the ground during the whole; whence he concludes, that a frost may be very intense and dangerous on the tops of some hills and plains; while in other places it keeps at two, three, or four feet distance above the ground, rivers, lakes, &c. and may wander about very furious in some places, and remiss in others not far off. The frost was followed by glowing heats, and a wonderful forwardness of flowers and fruits.

FREEZING MIXTURE. See COLD.

FREIGHT. (*fret*, French.) The money paid for carriage of goods by sea; or, in a larger sense, it is taken for the cargo, or burthen of the ship. Ships are freighted either by the ton, or by the great; and in respect to time, the freight is agreed for at so much per month, or at a certain sum for the whole voyage. If a ship freighted by the great happens to be cast away, the freight is lost; but if a merchant agrees by the ton, or at so much for every piece of commodities, and by any accident the ship is cast away, if part of the goods is saved, it is said she ought to be answered her freight *pro rata*: and when a ship is insured and such a misfortune happens, the insured commonly transfer those goods over to the assurers, towards a satisfaction of what they make good. *Lex mercat.*

FREIGHT, also denotes a duty of 50 sols per ton formerly paid to the crown of France, by the masters of foreign vessels going in, or out of, the several ports of the kingdom.

To FREIGHT. *v. a.* pret. *freighted*; part. *fraught, freighted.* (*fretter*, French.) 1. To load a ship or vessel of carriage with goods for transportation (*Shakspeare*). 2. To load as the burden; to be the thing with which a vessel is freighted (*Shakspeare*).

FREI'GHTER. *s.* (*fretteur*, Fr.) He who freights a vessel.

FREIND (John), a most learned English physician and writer in the 18th century, was born at Croton, Northamptonshire, in 1675. In 1696 he published, in conjunction with Mr. P. Foulkes, an edition of two Greek orations, one of Æschines against Ctesiphon, and the other of Demosthenes De Corona, with a new Latin version. In 1699 he wrote a letter to Dr. Sloane concerning an Hydrocephalus, published in the Philosophical Transactions; and another letter in Latin to the same gentleman, De spasmis rarior. historia, printed in the same Transactions. In 1703 his Emmenalogia appeared, which gained him great reputation. In 1704 he was chosen professor of chemistry in the university of Oxford. In 1705 he attended the earl of Peterborough to Spain, as physician to the army there; and, upon his return in 1707, published an account of the earl's expedition and conduct. In 1709 he published his Chemical Lectures. In 1712 he attended the duke of Ormond in Flanders, as his physician. In 1716 he was admitted a fellow of the college of physicians in London. This year he published the first and third books of Hippocrates De morbis popularibus, with a Commentary on Fevers, written by himself. He sat a member for the borough of Launceston in Cornwall in 1722, when he distinguished himself by his opposition to the administration. March 1722 he was committed to the Tower on a charge of high treason: and, while he was under confinement, he wrote a Latin epistle to Dr. Mead, De quibusdam variolarum generibus; and began his History of Physic, the first part of which was published in 1725, and the second in 1726. Upon the accession of George II. to the throne, he was appointed physician in ordinary to the queen, who showed the utmost regard and esteem for him. He died at London in 1728. His works were published together in Latin, at London, 1733, in folio, and dedicated to the queen.

FREJUS, a town of France, in the department of Var. By the Romans, it was called Forum Julii; and had then a port on the Mediterranean, which is now above a mile from it. It is the birth-place of that great Roman general and philosopher Agricola; and near it some fine remains of antiquity are still visible. It is seated near the river Argens, in a morass,

40 miles N.E. of Toulon. Lon. 6. 50 E. Lat. 43. 26 N.

FREN. *s.* A stranger (*Spenser*).

FRENCH, in general, something belonging to France; thus we say, the French language, French customs, polity, &c. The French language, as it now stands, is no original or mother language, but a medley of several. Those that prevail most, and which are, as it were, the basis thereof, are, 1. The Celtic; whether that were a particular language itself, or whether it were only a dialect of the Gothic, as spoken in the west and north. 2. The Latin, which the Romans carried with them into Gaul, when they made the conquest thereof. And, 3. The Teutonic, or that dialect of the Teutonic used by the Franks, when they passed the Rhine, and established themselves in Gaul. Of these three languages, in the space of about thirteen hundred years, was the present French formed, such as it is now found. Its progress was very slow; and both the Italian and Spanish were regular languages long before the French.

Pasquier observes, it was under Philip de Valois that the French tongue first began to be polished: and that, in the register of the chamber of accounts of that time, there is a purity seen almost equal to that of the present age. However, the French was still a very imperfect language till the reign of Francis I. The custom of speaking Latin at the bar, and of writing the public acts and instruments of the courts of justice in that language, had made them overlook the French, their own language. Add, that the preceding ages had been remarkable for their ignorance, which was owing, in good measure, to the long and calamitous wars which France had been engaged in: whence the French noblesse deemed it a kind of merit not to know any thing; and the generals regarded little whether or no they wrote and talked politely, provided they could but fight valiantly.

But Francis I. who was the restorer of learning and the father of the learned, changed the face of things; and, after his time, Henry Stevens printed his book, De la Precellence du Langage François. The change was become very conspicuous at the end of the 16th century; and under Henry IV. Amyot, Coeffeteau, and Malherbe, contributed towards bringing it to its perfection; which the cardinal de Richelieu completed, by the establishment of the French academy.

One of the characters of the French language is, to be natural and easy. The words are ranged in it much in the same order as the ideas in our minds; in which it differs exceedingly from the Greek and Latin, where the inversion of the natural order of words is considered a beauty. Indeed the Hebrew surpasses even the French in this point; but then it comes short of it in copiousness and variety.

It must be added, however, that as to the analogy of grammar, and the simplicity wherewith the moods of verbs are formed, the English has the advantage not only over the French, but over all the known languages in the world; but then the turns, the expressions, and the idioms, of the English, are sometimes so quaint and extraordinary, that it loses a good deal of the advantage which its grammatical simplicity gives it over the rest.

The French has but few compound words; wherein it differs widely from the Greek, High Dutch, and English. This the French authors own a great disadvantage in their language; the Greek and Dutch deriving a great part of their force and energy from the composition of words, and frequently expressing that in one sounding word, which the French cannot express but by a periphrasis. The diminutives in the French are as few as the compounds, the greatest part of those remaining in use having lost their diminutive signification; but what most distinguish the French language, are its justness, purity, accuracy, and flexibility.

FRENCH OR KIDNEY BEAN. See PHASEOLUS.

FRENCH HONEYSUCKLE. See HEDYSARUM.

FRENCH MARIGOLD. See TAGETES.

FRENCH WILLOW. See EPILOBIUM.

To FRE'NCHIFY. *v. a.* (from *French.*) To infect with the manners of France; to make a coxcomb (*Camden*).

FRE'NETIC. *a.* (*frenetique*, French; φρενητικος; generally therefore written *phrenetick.*) Mad; distracted (*Daniel*).

FRE'NZY. *s.* (φρενιτις; *phrenitis*, Latin.) Madness; distraction of mind; alienation of understanding; any violent passion approaching to madness (*Bentley*).

FRE'QUENCE. *s.* (*frequence*, French.) Crowd; concourse; assembly (*Milton*)

FRE'QUENCY. *s.* (*frequentia*, Latin.) 1. Common occurrence; the condition of being often seen or done (*Atterbury*). 2. Concourse; full assembly (*Ben Jonson*).

FRE'QUENT. *a.* (*frequent*, French; *frequens*, Latin.) 1. Often done; often seen; often occurring (*Pope*). 2. Used often to practise any thing (*Swift*). 3. Full of concourse (*Milton*).

To FREQUE'NT. *v. a.* (*frequento*, Latin.) To visit often; to be much in any place (*Bacon*).

FREQUE'NTABLE. *a.* (from *frequent.*) Conversible; accessible (*Sidney*).

FREQUE'NTATIVE. *a.* (*frequentativus*, Latin.) A grammatical term applied to verbs signifying the frequent repetition of an action.

FREQUE'NTER. *s.* (from *frequent.*) One who often resorts to any place (*Swift*).

FREQUE'NTLY. *ad.* (*frequenter*, Latin.) Often; commonly; not rarely (*Swift*).

FRESCATI. See FRASCATI.

FRE'SCO. *s.* (Italian.) 1. Coolness; shade; duskiness (*Prior*). 2. A picture not drawn in glaring light, but in dusk (*Pope*).

FRESCO, in painting, an Italian word now universally adopted, signifying paintings performed on the walls of palaces and churches. There cannot be a doubt, that this was the ori-

ginal method, in which all large subjects were done immediately after the discovery of the art of expressing forms and substances, by the judicious disposition of different coloured earths diluted with water. Savages found in a complete state of nature, who knew nothing more than her immediate dictates, have been found covered with colours, collected, and used on their persons by instinct; and some have even demonstrated genius, in working the beautiful mantles and helmets formed of feathers of the most vivid tints: one step more would have produced painting on walls, but it was reserved for the ancient Grecians to enlighten and benefit the world by the superior talents they had received and cultivated. It would be vain to enter into an investigation when their attempts arrived to that state of comparative perfection, which produced the delineation of figures on plaster or similar composition; we must, therefore, be satisfied with describing some still extant of very great antiquity, and mentioning the modern method of using the colours.

It may reasonably be supposed, that the first pictures painted in this way were extremely rude, and probably did not consist of more than two colours, a light one for the ground, and a dark for the outlines; for blending the tints must have been the result of experience, and some degree of freedom. This supposition may be illustrated by referring to the valuable vases brought from Herculaneum, by the late sir William Hamilton, and now deposited in the British Museum. Those, and the paintings found in the same city, were in all probability the performances of Italians: but as the art was then evidently in its infancy, the Greeks might not have excelled their imitators. Indeed painting must have been considered by that ingenious people as an art inferior to that of sculpture; which accounts for the superior excellence, and earlier improvements, in the latter.

The appendix to the abbé Barthelemy's travels in Italy contains several curious remarks on Herculaneum, by count Caylus and others, and Du Theil: the latter supposes that the destruction of this city happened in the year 471. Caylus, on treating upon the ancient paintings discovered, observes, "As to their designing, it is dry, and hardly ever exceeds the idea of a fine statue. The composition is in general cold, for the same reason that the design is dry. In fact, a figure is not grouped, though it be placed with others; and statues, intended at first to stand alone, will with difficulty enter into composition without some alteration; though the Diana in the Thesus, and the woman with wings in the Telephus, are more contrasted, and have an air of motion.

"The general taste of the composition is remarkable, not only for its resemblance to statues, as I have observed before, but to bas reliefs also. It is clear that the authors had them present to their imagination, and that they had made on their minds a very lively impression.

"The demi-tints are of an olive grey, or of a yellowish or reddish cast, and the shades of red, mixed with black. The draperies, in general, are made with little plaits, formed of light and flexible stuffs, after the style of Roman sculpture." The picture of Telephus is, however, an exception, and seems to lead the author to think, that the artist who performed this piece was superior to those who executed the others.

In the aggregate there are no groupes, harmony, or claro obscuro. Each figure stands, as it were, independent, with its own light and shade only, neither receiving reflected light from the next, nor casting shade on it; nor are the shades broken, but done with the same colour as the half tints, and have merely less white. This peculiarity arose from their deficiency in the science of perspective, which reduced the artist to the necessity of making the graduation of distance by the faintness of his colours. "For the rest," adds the count, "the pictures are done with ease, the touch is bold, and the pencil handled freely, the colouring being sometimes laid on patches, and sometimes softened down; in a word, the execution is light, and in the same style nearly as we paint the decorations of our theatres, the whole indicating a great practice in the artists."

Thus much is considered necessary, in order to show that the adoption of many colours in fresco paintings took place subsequent to 471; like all other arts, it must have been improved by degrees, and it cannot be doubted, that the great masters, whose labours still adorn the numerous churches and palaces in Italy, contributed largely to its perfection; though it is well known that many of their best works have suffered from damps, which it is presumed will prevent their stability wherever it prevails. This circumstance has operated to so great a degree in St. Peter's at Rome, that most of the old pictures have been replaced by others in mosaic. See Mosaic.

The same cause has prevented the frequent use of fresco painting in England, except in mansions where a dry air is constantly preserved. The necessity of this precaution is demonstrated at present in the dome of St. Paul's. The manner of performing this description of painting, is to work while the plaster is wet which covers the wall to be decorated; consequently, in the execution of large subjects, the process of plastering must immediately precede the brush of the artist, and only in the proportion he works, that the colours may incorporate with the composition, and that it may not absorb the water which dilutes them, and prevent the free touches intended for effect.

Vitruvius, who calls fresco painting udo tectorio, gives an accurate account of the extreme care which the ancients thought necessary in preparing the stuccoes for the colours, and it must be admitted that they succeeded admirably, when we consider how very perfect the remains of their productions now are, after undergoing the sulphureous inhumation

of ashes, caused by the eruption of Vesuvius, one thousand three hundred and thirty-seven years past. The moderns, however, conceive that their lime and sand is preferable.

The design intended for a wall should be drawn on paper, or any substance from whence it may be transferred to the wet plaster; the mode of proceeding must afterwards be similar to that practised in painting upon canvas. The colours should be earths, exclusively, diluted with water sufficiently to make them flow freely, but not to decompose the plaster and mix its surface with them; long soft haired brushes should therefore be preferred. (*Brit. Ency.*).

FRESH. *a.* (ꝼꞃeꞅc, Saxon.) 1. Cool; not vapid with heat (*Prior*). 2. Not salt (*Abbot*). 3. New; not had before (*Dryden*). 4. New; not impaired by time (*Milton*). 5. In a state like that of recentness (*Denham*). 6. Recent; newly come (*Dryden*). 7. Repaired from any loss or diminution (*Dryden*). 8. Florid; vigorous; cheerful; unfaded; unimpaired (*Bacon*). 9. Healthy in countenance; ruddy (*Harvey*). 10. Brisk; strong; vigorous (*Holder*). 11. Fasting: opposed to eating or drinking. 12. Sweet: opposed to stale or stinking.

FRESH. *s.* Water not salt (*Shakspeare*).

To FRE'SHEN. *v. a.* (from *fresh.*) To make fresh (*Thomson*).

To FRE'SHEN. *v. n.* To grow fresh (*Pope*).

FRESHES, among sailors, the violence of an ebb-tide, increased by heavy rains, flowing into the sea, which it discolours to a considerable distance from the shore on such occasions, where the line on which the two colours meet may be distinctly observed for a great length along the coast.

FRE'SHET. *s.* (from *fresh.*) A pool of fresh water (*Milton*).

FRE'SHLY. *ad.* (from *fresh.*) 1. Coolly. 2. Newly; in the former state renewed (*Bacon*). 3. With a healthy look; ruddily (*Shakspeare*).

FRE'SHNESS. *s.* (from *fresh.*) 1. Newness; vigour; spirit; the contrary to vapidness (*Bacon*). 2. Freedom from diminution by time; not staleness; not decay (*South*). 3. Freedom from fatigue; newness of strength (*Hayward*). 4. Coolness (*Addison*). 5. Ruddiness; colour of health (*Granville*). 6. Freedom from saltness.

FRESNE (Charles du Cange du), a learned Frenchman, born at Amiens in 1610. He was bred to the law, and became advocate in the parliament of Paris. He compiled a glossary of low Latin, intitled, Glossarium Mediæ et infimæ Latinitatis, which has been frequently printed. The best edition is that of Halle, in 6 vols. 8vo. 1772-1784. His Greek Glossary of the middle Age, in 2 vols. folio, is also an esteemed work. He also published a History of Constantinople, and various other books, and died in 1688.

FRESNOY (Charles Alphonsus du), a French painter and poet. He was born at Paris in 1611, and having studied under Pertier Vouet, he went to Rome, where he suffered great hardships, owing to his having adopted a profession contrary to the wishes of his parents. However he persevered in his studies, and while he was employed in copying the works of the best masters, he planned a Latin poem, De Arte Graphica, which was afterwards published. This ingenious man died in 1665. His poem was printed after his death, with a prose translation, by de Piles, with notes. It has been rendered into English, first by Dryden, and lastly by Mr. Mason. Fresnoy, as a painter, imitated Titian.

FRET. *s.* (*fretum*, Latin.) 1. A frith, or strait of the sea, where the water by confinement is always rough (*Brown*). 2. An agitation of liquors by fermentation, or other cause (*Derham*). 3. Work rising in protuberances (*Spectator*). 4. Agitation of the mind; commotion of temper (*Herbert*).

FRET, or FRETTE, in architecture, a kind of knot or ornament, consisting of two lists or small fillets variously interlaced or interwoven, and running at parallel distances equal to their breadth. A necessary condition of these frets is, that every return and intersection be at right angles. This is so indispensable, that they have no beauty without it, but become perfectly Gothic.

FRET-WORK, that adorned with frets. It is sometimes used to fill up and enrich flat empty spaces; but it is mostly practised in roofs, which are fretted over with plaister work.

FRETS, certain short pieces of wire fixed on the finger-board of guitars, &c. at right angles to the strings, and which, as the strings are brought into contact with them by the pressure of the fingers, serve to vary and determine the pitch of the tones.

To FRET. *v. a.* (from the noun.) 1. To agitate violently by external impulse or action (*Shakspeare*). 2. To wear away by rubbing (*Newton*). 3. To hurt by attrition (*Milton*). 4. To corrode; to eat away (*Hakewill*). 5. To form into raised work (*Milton*). 6. To variegate; to diversify (*Shakspeare*). 7. To make angry; to vex (*Ezekiel*).

To FRET. *v. n.* 1. To be in commotion; to be agitated (*South*). 2 To be worn away; to corrode (*Peach.*). 3 To make way by attrition (*Moxon*). 4. To be angry; to be peevish (*Pope*).

FRE'TFUL. (from *fret.*) Angry; peevish.

FRE'TFULLY. *ad.* Peevishly.

FRE'TFULNESS. *s.* (from *fretful.*) Passion; peevishness.

FRE'TTY. *a.* (from *fret.*) Adorned with raised work.

FREUDENSTADT, a strong town of Suabia, in the Black Forest, built to defend the passage into this forest. It is 12 miles S.E. of Strasburg. Lon. 8. 21 E. Lat. 48. 28 N.

FREYBERG, or FRIEDBERG, a town of Upper Saxony, containing above 60,000 inhabitants. In the environs are mines of copper, tin, lead, and silver, which employ a great number of workmen, and produce above 10,000 rix-dollars a-year. Here is the usual

burying-place of the princes of the electoral house of Saxony. It is situate on a branch of the Muldau, 15 miles S.W. of Dresden. Lon. 11. 10 W. Lat. 51. 0 N.

FREYSINGEN, a town of Germany, capital of a bishopric of the same name, in the circle of Bavaria. It was taken by the French in 1796. It is seated on a mountain, near the Iser, 20 miles N. by E. of Munich. Lon. 11. 50 E. Lat. 48. 20 N.

FREZIERA. In botany, a genus of the class polyandria, order monogynia. Calyx five-leaved; petals five; style trifid; berry juiceless; many-celled, many-seeded. Two species: one a native of Jamaica, the other of the East Indies.

FRIABI'LITY. *s.* (from *friable.*) Capacity of being easily reduced to powder (*Locke*).

FRI'ABLE. *a.* (*friable*, French.) Easily crumbled; easily reduced to powder (*Bacon*).

FRIAR, or FRIER, by the Latins called *frater*, the Italians *fra*, and the French *frere*, that is, *brother*: a term common to the monks of all orders; founded on this, that there is a kind of fraternity or brotherhood presumed between the several religious persons of the same convent or monastery.

FRIAR'S COWL. See ARUM.

FRI'ARLIKE. *a.* (from *friar.*) Monastic; unskilled in the world (*Knolles*).

FRI'ARLY. *a.* (*friar* and *like.*) Like a friar, or man untaught in life (*Bacon*).

FRI'ARSCOWL. *s.* (*friar* and *cowl.*) A plant that produces a flower resembling a cowl.

FRI'ARY. *s.* (from *friar.*) A monastery or convent of friars.

FRI'ARY. *a.* Like a friar (*Camden*).

To FRI'BBLE. *v. n.* To trifle (*Hudibras*).

FRI'BBLER. *s.* A trifler (*Spectator*).

FRIBURG, one of the cantons of Swisserland, surrounded on all sides by the canton of Bern. It is fertile in corn, fruits, and pastures. Its length is about 40 miles, and breadth 20.

FRIBURG, a town of Swisserland, capital of a canton of the same name. The public buildings, especially the cathedral, are very handsome. The inhabitants are papists. It is governed in spirituals by the bishop of Lausanne, who resides here, and in temporals, by a council, over which an avoyer presides. Its situation is very extraordinary, for part of it is built on an elevated rock, part of it in a deep valley, and towards the west it occupies a small plain. The streets are irregular, steep, clean, and tolerably wide; the houses are well built, and some of them handsome; there are several churches and convents. It is surrounded with walls, towers, and sharp rocks. Friburg contains some manufactures, but none that are important. Lat. 46. 48 N. Lon. 6. 53 E.

FRIBURG, a town of Germany, in the circle of Swabia, and capital of the Austrian Brisgaw, situated at the foot of a stony mountain, on the river Trasam, founded in the year 1118, by Berthold III, duke of Zahringen, from whom it came to the counts of Furstenberg, with whom it had many disputes on account of its privileges, and at last purchased its freedom for 20,000 marks of silver. This sum was advanced by the house of Austria, by which means the town became subject to that family. It was formerly an important fortress, but being taken several times by the Swedes and the French, it was dismantled by the latter, in the year 1744. The streets are broad and well paved. The principal church is a superb edifice. Here is a university, founded in 1457, by Albert IV. duke of Austria, with an academy and five colleges depending on it. Here are, besides ten convents, a commandery of the Teutonic order, and thirteen churches. Lat. 48. 10 N. Lon. 7. 57 E.

FRICASSE'E. *s.* (French.) A dish made by cutting chickens or other small things in pieces, and dressing them with strong sauce.

FRICA'TION. *s.* (*fricatio*, Latin.) The act of rubbing one thing against another (*Bacon*).

FRIC'TION. *s.* (*frictio*, Latin.) 1. The act of rubbing two bodies together (*Newton*). 2. The resistance in machines caused by the motion of one body upon another. 3. Medical rubbing with the fleshbrush or cloths (*Bacon*).

FRICTION, when expressive of the act of rubbing or grating the surfaces of bodies against or over each other is called also attrition.

The phænomena arising from the friction of divers bodies, under different circumstances, are very numerous and considerable. Mr. Hawksbee gives a number of experiments of this kind; particularly of the attrition or friction of glass, under various circumstances; the result of which was, that it yielded light, and became electrical. Indeed all bodies by friction are brought to conceive heat; many of them to emit light; particularly a cat's back, sugar, beaten sulphur, mercury, sea water, gold, copper, &c. but, above all, diamonds, which when briskly rubbed against glass, gold, or the like, yield a light equal to that of a live coal when blowed by the bellows.

FRICTION, in mechanics, denotes the resistance a moving body meets with from the surface on which it moves. Friction arises from the roughness or asperity of the surface of the body moved on, and that of the body moving: for such surfaces consisting alternately of eminences and cavities, either the eminences of the one must be raised over those of the other, or they must be both broken and worn off: but neither can happen without motion, nor can motion be produced without a force impressed. Hence the force applied to move the body is either wholly or partly spent on this effect; and consequently there arises a resistance or friction, which will be greater as the eminences are greater, and the substance the harder; and as the body, by continual friction, becomes more and more polished, the friction diminishes.

M. Amontons was the first philosopher who favoured us with any thing like correct information upon this subject. He found that the resistance opposed to the motion of a body upon a horizontal surface was exactly proportional to its weight, and was equal to one third of it, or more generally to one third of the force with which it was pressed against the surface over which it moved. He discovered also that this resistance did not increase

with an increase of the rubbing superficies, nor with the velocity of its motion.

The experiments of M. Bulfinger authorized conclusions similar to those of Amontons, with this difference only, that the resistance of friction was equal only to one fourth of the force with which the rubbing surfaces were pressed together.

This subject was also considered by Parent, who supposed that friction is occasioned by small spherical eminences in one surface being dragged out of corresponding spherical cavities in the other, and proposed to determine its quantity by finding the force which would move a sphere standing upon three equal spheres. This force was found to be to the weight of the sphere as 7 to 20, or nearly one third of the sphere's weight. In investigating the phenomena of friction, M. Parent placed the body upon an inclined plane, and augmented or diminished the angle of inclination till the body had a tendency to move, and the angle at which the motion commenced he called the angle of equilibrium. The weight of the body, therefore, will be to its friction upon the inclined plane as radius to the sine of the angle of equilibrium, and its weight will be to the friction on a horizontal plane as radius to the tangent of the equilibrium.

The celebrated Euler seems to have adopted the hypothesis of Bulfinger respecting the ratio of friction to the force of pression; and in two curious dissertations which he has published upon this subject, has suggested many important observations, to which Mr. Vince seems afterwards to have attended. He observes, that when a body is in motion, the effect of friction will be only one half of what it is when the body has begun to move; and he shews that if the angle of an inclined plane be gradually increased till the body which is placed upon it begins to descend, the friction of the body at the very commencement of its motion will be to its weight or pressure upon the plane as the sine of the plane's elevation is to its cosine, or as the tangent of the same angle is to radius, or as the height of the plane is to its length. But when the body is in motion the friction is diminished, and may be found by the following equation $\mu = \tan. a - \frac{m}{15625nn \cos. a}$, in which μ is the quantity of friction, the weight or pressure of the body being $=1$, a is the angle of the plane's inclination, m is the length of the plane in 1000th parts of a rhinland foot, and n the time of the body's descent. Respecting the cause of friction, Euler is nearly of the same opinion with Parent; the only difference is, that instead of regarding the eminences and corresponding depressions as spherical, he supposes them to be angular, and imagines the friction to arise from the body's ascending a perpetual succession of inclined planes.

Mr. Ferguson found that the quantity of friction was always proportional to the weight of the rubbing body, and not to the quantity of surface, and that it increased with an increase of velocity, but was not proportional to the augmentation of celerity. He found also that the friction of smooth soft wood, moving upon smooth soft wood, was equal to $\frac{1}{3}$ of the weight; of rough wood upon rough wood $\frac{1}{2}$ of the weight; of soft wood upon hard, or hard upon soft, $\frac{1}{5}$ of the weight; of polished steel upon polished steel or pewter $\frac{1}{4}$ of the weight; of polished steel upon copper $\frac{1}{5}$, and of polished steel upon brass $\frac{1}{6}$ of the weight.

The Abbé Nollet and Bossut have distinguished friction into kinds, that which arises from one surface being dragged over another, and that which is occasioned by one body rolling upon another. The resistance which is generated by the first of these kinds of friction is always greater than that which is produced by the second; and it appears evidently from the experiments of Muschenbroek, Schoeber, and Meister, that when a body is carried along with an uniformly accelerated motion, and retarded by the first kind of friction, the spaces are still proportional to the squares of the times, but when the motion is affected by the second kind of friction, this proportionality between the spaces and the times of their description does not obtain.

The subject of friction has more lately occupied the attention of the ingenious Mr. Vince of Cambridge. He found that the friction of hard bodies in motion is an uniformly retarding force, and that the quantity of friction considered as equivalent to a weight drawing the body backwards is equal to $M - \frac{M \times W \times S}{rt^2}$, where M is the moving force expressed by its weight, W the weight of the body upon the horizontal plane, S the space through which the moving force or weight descended in the time t and $r = 16{\cdot}087$ feet, the force of gravity. Mr. Vince also found that the quantity of friction increases in a less ratio than the quantity of matter or weight of the body, and that the friction of a body does not continue the same when it has different surfaces applied to the plane on which it moves, but that the smallest surfaces will have the least friction.

Notwithstanding these various attempts to unfold the nature and effects of friction, it was reserved for the celebrated Coulomb to surmount the difficulties which are inseparable from such an investigation, and to give an accurate and satisfactory view of this complicated part of mechanical philosophy. By employing large bodies and ponderous weights, and conducting his experiments on a large scale, he has corrected several errors which necessarily arose from the limited experiments of preceding writers; he has brought to light many new and striking phenomena, and confirmed others which were hitherto but partially established. As it would be foreign to the nature of this work to follow monsieur Coulomb through his numerous and varied experiments, we shall only present the reader with the new and interesting results which they authorized.

1. The friction of homogeneous bodies, or bodies of the same kind moving upon one another is generally supposed to be greater than that of heterogeneous bodies; but Coulomb has shewn that there are exceptions to this rule. He found, for example, that the friction of oak upon oak was equal to $\frac{1}{2{\cdot}34}$ of the force of pression; the friction of pine against pine was $\frac{1}{1{\cdot}78}$, and of oak against pine $\frac{1}{1{\cdot}5}$. The friction of oak against copper was $\frac{1}{5{\cdot}5}$, and that of oak against iron nearly the same.

2. It was generally supposed, that in the case of wood, the friction is greatest when the bodies

are dragged contrary to the course of their fibres; but Coulomb has shewn that the friction is in this case sometimes the smallest. When the bodies moved in the direction of their fibres the friction was $\frac{1}{2 \cdot 34}$ of the fibres with which they were pressed together; but when the motion was contrary to the course of the fibres, the friction was only $\frac{1}{3 \cdot 76}$.

3. The longer the rubbing surfaces remain in contact, the greater is their friction.—When wood was moved upon wood, according to the direction of the fibres, the friction was increased by keeping the surfaces in contact for a few seconds; and when the time was prolonged to a minute, the friction seemed to have reached its farthest limit. * But when the motion was performed contrary to the course of the fibres, a greater time was necessary before the friction arrived at its maximum. When wood was moved upon metal, the friction did not attain its maximum till the surfaces continued in contact for 5 or 6 days; and it is very remarkable, that when wooden surfaces were anointed with tallow, the time requisite for producing the greatest quantity of friction is increased. The increase of friction which is generated by prolonging the time of contact is so great, that a body weighing 1650 pounds was moved with a force of 64 pounds when first laid upon its corresponding surface. After having remained in contact for the space of 3 seconds, it required 160 pounds to put it in motion, and when the time was prolonged to 6 days, it could scarcely be moved with a force of 622 pounds. When the surfaces of metallic bodies were moved upon one another, the time of producing a maximum of friction was not changed by the interposition of olive oil; it was increased, however, by employing swines grease as an unguent, and was prolonged to 5 or 6 days by besmearing the surfaces with tallow.

4. Friction is in general proportional to the force with which the rubbing surfaces are pressed together; and is, for the most part, equal to between ½ and ¼ of that force.——In order to prove the first part of this proposition, Coulomb employed a large piece of wood, whose surface contained 3 square feet, and loaded it successively with 74 pounds, 874 pounds, and 2474 pounds. In these cases the friction was successively $\frac{1}{2 \cdot 46}$, $\frac{1}{2 \cdot 16}$, $\frac{1}{2 \cdot 21}$ of the force of pression; and when a less surface and other weights were used, the friction was $\frac{1}{2 \cdot 36}$, $\frac{1}{2 \cdot 42}$, $\frac{1}{2 \cdot 40}$. Similar results were obtained in all Coulomb's experiments, even when metallic surfaces were employed. The second part of the proposition has also been established by Coulomb. He found that the greatest friction is engendered when oak moves upon pine, and that it amounts to $\frac{1}{1 \cdot 78}$ of the force of pression; on the contrary, when iron moves upon brass, the least friction is produced, and it amounts to ¼ of the force of pression.

5. Friction is in general not increased by augmenting the rubbing surfaces.——When a superficies of 3 feet square was employed, the friction, with different weights, was $\frac{1}{2 \cdot 28}$ at a medium; but when a smaller surface was used, the friction instead of being greater, as might have been expected, was only $\frac{1}{2 \cdot 19}$.

6. Friction for the most part is not augmented by an increase of velocity. In some cases, however, it is diminished by an augmentation of celerity.—M. Coulomb found, that when wood moved upon wood in the direction of the fibres, the friction was a constant quantity, however much the velocity was varied; but that when the surfaces were very small in respect to the force with which they were pressed, the friction was diminished by augmenting the rapidity: the friction, on the contrary, was increased when the surfaces were very large when compared with the force of pression. When the wood was moved contrary to the direction of its fibres, the friction in every case remained the same. If wood is moved upon metals, the friction is greatly increased by an increase of velocity; and when metals move upon wood besmeared with tallow, the friction is still augmented by adding to the velocity. When metals move upon metals, the friction is always a constant quantity; but when heterogeneous substances are employed which are not bedaubed with tallow, the friction is so increased with the velocity, as to form an arithmetical progression when the velocities form a geometrical one.

7. The friction of loaded cylinders rolling upon a horizontal plane, is in the direct ratio of their weights, and the inverse ratio of their diameters. In Coulomb's experiments, the friction of cylinders of guaiacum wood, which were two inches in diameter, and were loaded with 1000 pounds, was 18 pounds or $\frac{1}{56}$ of the force of pression. In cylinders of elm, the friction was greater by $\frac{1}{3}$, and was scarcely diminished by the interposition of tallow.

From a variety of experiments on the friction of the axis of pullies, Coulomb obtained the following results:—When an iron axle moved in a brass bush or bed, the friction was $\frac{1}{6}$ of the pression; but when the bush was besmeared with very clean tallow, the friction was only $\frac{1}{7}$, when swines grease was interposed, the friction amounted to $\frac{1}{8 \cdot 5}$, and when olive oil was employed as an unguent, the friction was never less than $\frac{1}{7}$ or $\frac{1}{7 \cdot 5}$. When the axis was of green oak, and the bush of guaiacum wood, the friction was $\frac{1}{26}$ when tallow was interposed; but when the tallow was removed so that a small quantity of grease only covered the surface, the friction was increased to $\frac{1}{17}$. When the bush was made of elm, the friction was in similar circumstances $\frac{1}{13}$ and $\frac{1}{20}$ which is the least of all. If the axis be made of box, and the bush of guaiacum wood, the friction was $\frac{1}{21}$ and $\frac{1}{14}$, circumstances being the same as before. If the axle be of boxwood, and the bush of elm, the friction will be $\frac{1}{27}$ and $\frac{1}{20}$; and if the axle be of iron and the bush of elm, the friction will be $\frac{1}{20}$ of the force of pression.

Having thus considered the origin, the nature, and the effects of friction, we shall now attend to the methods of lessening the resistance which it opposes to machinery. The most efficacious mode of accomplishing this, is to convert that species of friction which arises from one body being dragged over another, into that which is occasioned by one body rolling upon another. As this will al-

ways diminish the resistance, it may be easily effected by applying wheels or rollers to the sockets or bushes which sustain the gudgeons of large wheels, and the axles of wheel carriages. Casatus seems to have been the first who recommended this apparatus. It was afterwards mentioned by Sturmius and Wolfius; but was not used in practice till Sully applied it to clocks in the year 1716, and Mondran to cranes in 1725. Notwithstanding these solitary attempts to introduce friction wheels, they seem to have attracted but little attention till the celebrated Euler examined and explained, with his usual accuracy, their nature and advantages. The diameter of the gudgeons and pivots should be made as small as the weight of the wheel and the impelling force will permit. The gudgeons should rest upon two wheels as large as circumstances will allow, having their axis as near each other as possible, but no thicker than what is absolutely necessary to sustain the superincumbent weight. When these precautions are properly attended to, the resistance which arises from the friction of the gudgeons, &c. will be extremely trifling.

The effects of friction may likewise in some measure be removed by a judicious application of the impelling power, and by proportioning the size of the friction wheels to the pressure which they severally sustain. If we suppose, for example, that the weight of a wheel, whose iron gudgeons move in bushes of brass, is 100 pounds; then the friction arising from both its gudgeons will be equivalent to 25 pounds. If we suppose also that a force equal to 40 pounds is employed to impel the wheel, and acts in the direction of gravity, as in the case of overshot wheels, the pressure of the gudgeons upon their supports will thus be 140 pounds and the friction 35 pounds. But if the force of 40 pounds could be applied in such a manner as to act in direct opposition to the wheel's weight, the pressure of the gudgeons upon their supports would be 100—40, or 60 pounds, and the friction only 15 pounds. It is impossible indeed to make the moving force act in direct opposition to the gravity of the wheel, in the case of water-mills; and it is often impracticable for the engineer to apply the impelling power but in a given way; but there are many cases in which the moving force may be so exerted, as at least not to increase the friction which arises from the wheel's weight.

The application of these general principles to particular cases is so simple as not to require any illustration. To aid the conceptions, however, of the practical mechanic, we may mention two cases in which friction wheels have been successfully employed.

Mr. Gottlieb, the constructor of a new crane, has received a patent for what he calls an anti-attrition axle-tree, the beneficial effects of which he has ascertained by a variety of trials. It consists of a steel roller about 4 or 6 inches long, which turns within a groove cut in the inferior part of the axle. When wheel-carriages are at rest, Mr. Gottlieb has given the friction wheel its proper position; but it is evident that the point of greatest pressure will change when they are put in motion, and will be nearer the front of the carriage. This point, however, will vary with the weight of the load; but it is sufficiently obvious that the friction roller should be but a little distance from the lowest point of the axle-tree.

Mr. Garnett of Bristol has applied friction rollers in a different manner, which does not, like the preceding method, weaken the axle-tree. Instead of fixing the rollers in the iron part of the axle, he leaves a space between the nave and the axis to be filled with equal rollers almost touching each other. The axes of these rollers are inserted in a circular ring at each end of the nave and these rings, and consequently the rollers are kept separate and parallel, by means of small bolts passing between the rollers from one side of the nave to the other.

In wheel-carriages constructed in the common manner with conical rims, there is a great degree of resistance occasioned by the friction of the linch-pins on the external part of the nave, which the ingenious mechanic may easily remove by a judicious application of the preceding principles.

As it appears from the experiments of Ferguson and Coulomb, that the least friction is generated when polished iron moves upon brass, the gudgeons and pivots of wheels, and the axles of friction rollers, should all be made of polished iron, and the bushes in which these gudgeons move, and the friction wheels should be formed of polished brass.

When every mechanical contrivance has been adopted for diminishing the obstruction which arises from the attrition of the communicating parts, it may be still farther removed by the judicious application of unguents. The most proper for this purpose are swine's grease and tallow, when the surfaces are made of wood, and oil when they are of metal. When the force with which the surfaces are pressed together is very great, tallow will diminish the friction more than swine's grease. When the wooden surfaces are very small, unguents will lessen their friction a little, but it will be greatly diminished if wood moves upon metal greased with tallow. If the velocities, however, are increased, or the unguent not often enough renewed, in both these cases, but particularly in the last, the unguent will be more injurious than useful. The best mode of applying it, is to cover the rubbing surfaces with as thin a stratum as possible, for the friction will then be a constant quantity, and will not be increased by an augmentation of velocity.

In small works of wood, the interposition of the powder of black lead has been found very useful in relieving the motion. The ropes of pulleys should be rubbed with tallow, and whenever the screw is used, the square threads should be preferred. (*Brewster's Ferguson, vol. ii.*)

A more detailed account of Coulomb's experiments may be seen in Gregory's Mechanics, vol. ii. p. 25—44.

FRICTION WHEELS, are small wheels on the circumferences of which the pivots of other wheels or axles turn, in order to lessen the quantity of friction, and give a longer duration to any motion. If a cylinder were to move on two small pins or gudgeons, the friction would be abated nearly in the proportion of the diameter of the cylinder to that of the pins: but the friction on these gudgeons is considerably diminished by causing each of them to move on the circumferences of two equal wheels; for the velocity of the circumference of each wheel is the same as that of the gudgeon which turns upon it; but the velocity of each wheel's axis (which is now to be considered as the rubbing part) is less than that of the wheel, in proportion as its diameter is less than that of the wheel, and the friction will be reduced accordingly.

It may be considered also, that in the friction

wheels, the pivot of the inner wheel does not slide, but roll over the perimeters of the others, and this diminishes the friction considerably; and if the axes of these wheels be laid on the perimeters of other wheels, the friction will be still farther reduced: and thus by applying more and more wheels it may be diminished ad infinitum.

FRI'DAY. *s.* (ꝼꞃıᵹeꝺæᵹ, Saxon.) The sixth day of the week, so named of *Freya*, a Saxon deity.

Friday (Good), a fast of the Christian church, in memory of the sufferings and death of Jesus Christ. It is observed on the Friday in *holy* or *passion week*; and it is called, by way of eminence, *good*, because of the blessed effects of our Saviour's sufferings, which were a propitiatory or expiating sacrifice for the sins of the world. The commemoration of our Saviour's sufferings has been kept from the first ages of Christianity, and was always observed as a day of fasting and humiliation.

FRIDBERG, a town of Wetteravia, in Germany. Lat 50. 10 N. Lon. 8. 46 E.

Fridberg, a town of Bavaria, in Germany. Lat. 48. 28 N. Lon. 11. 10 E.

FRIDING, a town of Suabia, in Germany, 30 miles N.E. of Constance. Lat. 48. 11 N. Lon. 2. 31 E.

FRIDLAND, a town of Bohemia, belonging to the house of Austria. Lat. 52. 4 N. Lon. 15. 15. E.

FRIDLENGEN, a town of Suabia, in Germany, 4 miles N. of Basle. Lat. 47. 40 N. Lon. 7. 36 E.

FRIDSTOL, mentioned in our ancient writers among the immunities granted to churches, signifies a seat, chair, or place of peace and security, where criminals might find safety and protection: of these there were many in England, but the most famous was at Beverley, and that in St. Peter's church at York, granted by charter of king Henry I.

FRIEND. *s.* (*vriend*, Dut. ꝼꞃeonꝺ, Sax.) 1. One joined to another in mutual benevolence and intimacy (*Dryden*). 2. One without hostile intentions (*Shakspeare*). 3. One reconciled to another (*Shakspeare*). 4. An attendant, or companion (*Dryden*). 5. Favourer; one propitious (*Peacham*). 6. A familiar compellation (*Matthew*).

Friends, a religious denomination. See Quakers.

To Friend. *v. a.* (from the noun.) To favour; to befriend; to countenance; to support (*Shakspeare*).

FRI'ENDLESS. *a.* Wanting friends; wanting support; destitute; forlorn (*South*).

FRI'ENDLINESS. *s.* (from *friendly*.) 1. A disposition to friendship (*Sidney*). 2. Exertion of benevolence (*Taylor*).

FRI'ENDLY. *a.* (from *friend*.) 1. Having the temper and disposition of a friend; kind; favourable (*Milton*). 2. Disposed to union; amicable (*Pope*). 3. Salutary; homogeneal (*Milton*).

Fri'endly. *ad.* In the manner of friends; with appearance of kindness; amicably (*Shakspeare*).

Friendly islands. Under this denomination we must include not only Tongataboo, Eaoo, and Anamooka, which were so named by captain Cook in 1773, on account of the friendship that subsists among the inhabitants, and their courteous behaviour to strangers; but also the group at Hapaee, visited by him in 1777; and all the islands that have been discovered nearly under the same meridian, from Pilstart, discovered by Tasman, in lat. 22. 26 S. down to Boscawen and Kepple's Isles, discovered by Wallis, in lat. 15. 53, and thence westward to Tasman's Prince William's Islands, in lon. 179. W. as well as some others, that have never been seen by any European navigator. Within these limits, the Archipelago will be found to be very extensive. Above 150 islands are reckoned up by the natives, who assign its proper name to each; fifteen of them are said to be high; 35 larger than Anamooka; and the rest small, many of them perhaps mere spots without inhabitants. 61 of these islands are laid down in captain Cook's chart of the Friendly Islands.

FRI'ENDSHIP. *s.* (*vriendschap*, Dutch.) 1. The state of minds united by mutual benevolence; amity (*Clarendon*). 2. Highest degree of intimacy (*Dryden*). 3. Favour; personal kindness (*Spenser*). 4. Assistance; help (*Shakspeare*). 5. Conformity; affinity; correspondence; aptness to unite (*Dryden*).

Friendship may be defined a mutual attachment subsisting between two persons; and arising, not merely from the general principle of benevolence, from emotions of gratitude for favours received, from views of interest, or from instinctive affection, or animal passion; but from an opinion entertained by each party, that the other is endowed with some amiable, estimable, or valuable qualities.

Voltaire says, "Friendship is a tacit contract between two sensible and virtuous persons. I say, *sensible*; for a monk, or a hermit, may not be wicked, yet may live a stranger to friendship. I add *virtuous*; for the wicked have only accomplices, the voluptuous have companions, the designing have associates, the men of business have partners, the politicians form a factious band; the bulk of idle men have connections; princes have courtiers: but virtuous men alone have friends. Cethegus was Catiline's accomplice, and Mecenas was Octavius's courtier; but Cicero was Atticus's *friend*."

Genuine friendship, then, is founded on virtue, and on that approbation which virtue never fails to command: it is a natural consequence of intercourse between virtuous men. Where it is once established, it cannot die, while those virtues to which it owes its origin continue to adorn the persons between whom it subsists.

Circumstances favourable to the formation of friendship are, parity (though not strict equality) of age, likeness of trade or profession, an approximation to equality of rank or fortune, similarity of taste, temper, and views,

and especially conformity in religious views. Whether sameness of sex is an *essential* requisite has been sometimes, though we think foolishly, disputed. Upon even a superficial view of life, we find reason to declare, without hesitation, that acquaintance and intimacy most naturally take place among persons of the same sex: yet there are cases where the warmest and purest friendships have subsisted between persons of different sexes. This, however, must always be where both parties are so circumstanced as to be in no danger of cherishing any other feeling.

Friendship often exists in the strongest degree among near relatives: and, though to some it may appear paradoxical, between husband and wife. The fears, the jealousies, the timidity, nay even the fondness of love, are in some measure incompatible with the full exercise of friendship: for, though the lover and his mistress be dear to each other, yet the free confidence and faithfulness of friendship cannot take place between them. They dare not yet venture to trust to each other all the secrets of their hearts, much less to exercise the freedom even of tender remonstrance, which friendship often demands. But if their mutual wishes be crowned by marriage; then, indeed, as their interests become the same, if the transports of love are not succeeded by the calm delights and the full confidence which friendship inspires, they cannot be happy. The marriage state, when formed upon right principles and correct views, is peculiarly favourable to the most elevated degree of friendship. Persons whose relations to each other are more remote, will often find circumstances concurring to induce them to cultivate a friendly intercourse with each other. But here indifference is almost impossible. It is absolutely requisite, in order that they may not render each other miserable, that the husband and the wife have that high esteem for each other's character, which stands as the basis of friendship. This seems even to be one of the great laws of nature, by which provision is made for the happiness and the preservation of society. But, though the wife and the husband be particularly attached to each other by the ties of friendship, no less than by those of love, yet their mutual affection will not entirely detach them from the rest of the world; their relations to the society around them will still remain; the husband will still cultivate the intimacy of those of his own sex, and the wife will still choose female in preference to male friends: and both may thus derive assistance, comfort, and advice, which they might not be able to supply to each other. Nor will this cause any undue separation, or any alienation of affection; for where husband and wife are united as we suppose, they are more than friends—they are *one bone and one flesh.*

Friendship requires sincerity, mutual confidence, though certainly not, as many have contended, union of interests. Its principal fruits are peace in the affections, support in the judgment, aid and support in conduct. Lord Bacon, in his excellent Essay on Friendship (an essay which we warmly recommend to the perusal of our readers), says, "Men have their time, and die many times in desire of some things which they principally take to heart, the bestowing of a child, the finishing of a work, or the like. If a man have a true friend he may rest almost secure that the care of those things will continue after him; so that a man hath, as it were, two lives in his desires. A man hath a body, and that body is confined to a place; but where friendship is, all offices of life are, as it were, granted to him and his deputy; for he may exercise them by his friend. How many things are there which a man cannot with any face or comeliness say or do himself? A man can scarce allege his own merits with modesty, much less extol them; a man cannot sometimes brook to supplicate or beg; and a number of the like: but all these things are graceful in a friend's mouth, which are blushing in a man's own. So again a man's person hath many proper relations which he cannot put off. A man cannot speak to his son but as a father; to his wife but as a husband; to his enemy but upon terms: whereas, a *friend* may speak as the case requires, and not as it sorteth to the person."

Several of our poets have descanted upon the nature, the delights, and advantages of friendship: we shall terminate this article with an extract or two from one of them, the author of the Night Thoughts.

Friendship's the wine of life; but friendship

is neither strong nor pure.

O! for the bright complexion, cordial warmth,
And elevating spirit of a friend,
For twenty summers rip'ning by my side;
All feculence of falsehood long thrown down;
All social virtues rising in his soul,
As crystal clear, and smiling as they rise!
Here nectar flows; it sparkles in our sight;
Rich to the taste, and genuine from the heart.

Deliberate on all things with thy friend:
But since friends grow not thick on ev'ry bough,
Nor ev'ry friend unrotten at the core;
First, on thy friend, delib'rate with thy self;
Pause, ponder, sift; not eager in the choice,
Not jealous of the chosen; fixing, fix;
Judge before friendship, then confide till death.

Of friendship's fairest fruits, the fruit most fair
Is virtue kindling at a rival fire,
And, emulously, rapid in her race.
O the soft enmity: endearing strife!
This carries friendship to her noon-tide point,
And gives the rivet of eternity.

FRIESLAND, one of the united provinces of the Low Countries. It is bounded on the east by the river Lauvers, which parts it from

the lordship of Groningen, on the south by Overyssel, on the west by the Zuider-Zee, and on the north by the German ocean. It is 30 miles from north to south, and 28 from east to west. The land is very fertile in corn and pasture; the horses are large, and the cows and sheep prolific. It is divided into three parts; Westergo to the west, Ostergo to the east, and Sevenwalden to the south. The islands of Sheling, Ameland, and other small ones, are dependent on this province. The principal towns are Leuwarden the capital, Franeker, Dockum, Harlingen, and Staveren.

FRIESLAND (East), a province of Germany, in the circle of Westphalia, lying near the German ocean. It is bounded on the south by the bishopric of Munster, on the east by the county of Oldenburg, on the west by the province of Groningen, and on the north by the sea, being about 50 miles in length, and 30 in breadth. It belongs to Prussia, and was formerly called the county of Embden. It is a very fertile country, and feeds a great number of cattle; but it was greatly damaged by an inundation in 1717, and the repair of the dykes cost an immense sum. The principal towns are Norden, Leer, Essens, Whitmunde, and Aurick. Embden was an imperial city, and the principal place in the country; but now belongs also to the king of Prussia, who bought it of the Dutch.

FRIESLAND (West), another name for that part of Holland called N. Holland. The states of Holland hence take the title of the states of Holland and W. Friesland.

FRIEZE. *s.* (*drap de frise*, Fr.) A coarse warm cloth, made perhaps first in Friesland (*Milton*).

FRIEZE. FRIZE. *s.* (In architecture.) A large flat member which separates the architrave from the cornice; of which there are as many kinds as there are orders of columns (*Harris*).

FRI'EZED, *a.* (from *frieze.*) Shagged or napped with frieze (*Addison*).

FRI'EZELIKE. *a.* (*frieze* and *like.*) Resembling a frieze (*Addison*).

FRIGATE, among seamen, a ship of war, light built, and that is a good sailer. A frigate has commonly two decks, whence that called a light frigate is a frigate with only one deck. These vessels mount from 20 to 44 guns, and make capital cruizers. Merchantmen are said to be frigate-built, when the disposition of the decks have a descent of four or five steps from the quarter-deck and forecastle into the waist, in contradistinction to those whose decks are on a continued line for the whole length of the ship, which are called galley-built. Formerly the name of frigate was only known in the Mediterranean, and applied to a kind of long vessels navigated in that sea with sails and oars. Our countrymen were the first who appeared in the ocean with those ships, and equipped them for war as well as commerce.

FRIGATOON, a Venetian vessel, commonly used in the Adriatic. It is built with a square stern without any foremast, having only a main-mast, mizen-mast, and bowsprit.

FRIGEFA'CTION. *s.* (*frigus* and *facio*, Lat.) The act of making cold.

To FRIGHT. *v. a.* (ꝼꞃiʒhꞇan, Saxon.) To terrify; to disturb with fear (*Dryden*).

FRIGHT, or TERROR, a sudden and violent degree of fear. See FEAR. Sudden fear is frequently productive of very remarkable effects upon the human system. Of this many instances occur in medical writings. In general, the effects of terror are a contraction of the small vessels, and a repulsion of the blood into the large and internal ones; hence proceed general oppression, trembling, and irregularity in the motions of the heart, whilst the lungs are also overcharged with blood.

Frights often occasion incurable diseases, as epilepsy, stupor, madness, &c. In this way they have evidently killed many, by the agitation into which they have thrown the spirits, already too much disordered. We have also accounts of persons absolutely killed by terrors when in perfect health at the time of receiving the shock. Out of many instances, the following is selected as one of the most singular: "George Grochantzy, a Polander, who had inlisted as a soldier in the service of the king of Prussia, deserted during the last war. A small party was sent in pursuit of him; and, when he least expected it, they surprised him singing and dancing among a company of peasants, who were got together in an inn, and were making merry. This event, so sudden and unforeseen, and at the same time so dreadful in its consequences, struck him in such a manner, that, giving a great cry, he became at once altogether stupid and insensible, and was seized without the least resistance. They carried him away to Glocau, where he was brought before the council of war, and received sentence as a deserter. He suffered himself to be led and disposed of at the will of those about him, without uttering a word, or giving the least sign that he knew what had happened or would happen to him. He remained immoveable as a statue wherever he was placed, and was wholly passive with respect to all that was done to him or about him. During all the time that he was in custody, he neither ate, nor drank, nor slept, nor had any evacuation. After some time they knocked off his fetters, and left him at liberty to go whither he would. He received his liberty with the same insensibility that he had showed upon other occasions: he remained fixed and immoveable; his eyes turned wildly here and there without taking cognizance of any object, and the muscles of his face were fallen and fixed like those of a dead body. Being left to himself, he passed 20 days in this condition, without eating, drinking, or any evacuation, and died on the 20th day."

Yet frights have been known not only to cause, but also to cure, diseases. Mr. Boyle speaks of agues, gout, and sciatica, cured by this means. To turn from the serious to the

ludicrous effects of fear, the following instance of the latter sort, quoted from a French author by Mr. Andrews, in his volume of Anecdotes, shews upon what slight occasions this passion may be sometimes excited in a very high degree, even in persons the most unlikely to entertain such a guest. "Charles Gustavus (the successor of Christina of Sweden) was besieging Prague, when a boor of most extraordinary visage desired admittance to his tent; and, being allowed entrance, offered, by way of amusing the king, to devour a whole hog of one hundred weight in his presence. The old general Konigsmare, who stood by the king's side, and who, soldier as he was, had not got rid of the prejudices of his childhood, hinted to his royal master that the peasant ought to be burnt as a sorcerer. 'Sir,' said the fellow, irritated at the remark, 'if your majesty will but make that old gentleman take off his sword and his spurs, I will eat him immediatly before I begin the hog.' General Konigsmare (who had, at the head of a body of Swedes, performed wonders against the Austrians, and who was looked upon as one of the bravest men of the age) could not stand this proposal, especially as it was accompanied by a most hideous and preternatural expansion of the frightful peasant's jaws. Without uttering a word, the veteran suddenly turned round, ran out of the court, and thought not himself safe until he had arrived at his quarters; where he remained above 24 hours locked up securely, before he had got rid of the panic which had so severely affected him."

Fear, observes Dr. Beattie in his Elements of Moral Science, should not rise higher than to make us attentive and cautious: when it gains an ascendency in the mind, it becomes an insupportable tyranny, and renders life a burden. The object of fear is evil; and to be exempt from fear, or at least not enslaved by it, gives dignity to our nature, and invigorates all our faculties. Yet there are evils which we ought to fear. Those that arise from ourselves, or which it is in our power to prevent, it would be madness to despise, and audacity not to guard against. External evils, which we cannot prevent, or could not avoid without a breach of duty, it is manly and honourable to bear with fortitude. Insensibility to danger is not fortitude, no more than the feeling pain can be called patience; and to expose ourselves unnecessarily to evil is worse than folly, and very blameable presumption. It is commonly called fool-hardiness; that is, such a degree of hardiness or boldness as none but fools are capable of. See the article FORTITUDE.

To FRI'GHTEN. *v.a.* To terrify; to shock with dread (*Prior*).

FRI'GHTFUL. *a.* (from *fright.*) Terrible; dreadful; full of terror (*Shakespeare*).

FRI'GHTFULLY. *ad.* (from *frightful.*) Dreadfully; horribly (*Burnet*).

FRI'GHTFULNESS. *s.* (from *frightful.*) The power of impressing terrour.

FRI'GID. *a.* (*frigidus,* Latin.) 1. Cold; wanting warmth (*Cheyne*). 2. Wanting warmth of affection. 3. Impotent; without warmth of body. 4. Dull; without fire of fancy (*Swift*).

FRIGI'DITY. *s.* (*frigiditas,* Lat.) 1. Coldness; want of warmth. 2. Dulness; want of intellectual fire (*Pope*). 3. Want of corporeal warmth (*Glanville*). 4. Coldness of affection.

FRI'GIDLY. *ad.* (from *frigid.*) Coldly; dully; without affection.

FRI'GIDNESS. *s.* (from *frigid.*) Coldness; dulness; want of affection.

FRIGORI'FIC. *s.* (*frigorificus, frigus,* and *facio,* Latin.) Causing cold (*Quincy*).

To FRILL. *v. a.* (*frilleux,* Fr.) To quake or shiver with cold. Used of a hawk; as, *the hawk* frills.

FRINGE. *s.* (*frange,* French.) Ornamental appendages added to dress or furniture (*Wotton*).

To FRINGE. *v. n.* (from the noun.) To adorn with fringes; to decorate with ornamental appendages (*Fairfax*).

FRINGE-TREE. See CHIONANTHUS.

FRINGED COROL. In botany, fimbriate. The edge surrounded by hairs or bristles not parallel or so regularly disposed as in the ciliate corol. Exemplified in *Menyanthes trifoliata*.

FRINGILLA. Finch. In zoology, a genus of the class aves, order passeres. Bill conic, straight, pointed. A hundred and twelve species; distributed over the globe; of which ten are natives of our own country.

The following are those most worthy of notice.

1. F. Calebs. Chaffinch; of which there are six varieties.

- α. Limbs black; quill feathers white on both sides; the three first without spots; two of the tail feathers obliquely white.
- β. Ashy; beneath flesh-colour; wing-coverts white, black in the middle; wings and tail black.
- γ. Body white.
- δ. Collar and crown white.
- ε. Fore-part white; hind-part ferruginous.
- ζ. Back yellowish, beneath very pale. Female wants the red on the breast and other parts. Inhabits Europe and Africa; the females migrate from Sweden to Holland in the autumn, leaving their mates behind, and return in the spring; sings early in the vernal months; lays from four to five dull white eggs spotted with deep purple.

2. F. Montifringilla. Mountain-finch. Brambling. Three varieties.

- α. Base of the wings beneath fine yellow.
- β. Eye-brows and band on the nape black; body beneath and rump white; chin and breast reddish; wing-coverts with a white band.
- γ. Body paler; head white.

Inhabits Europe and Siberia; variety β. Asia. Six and a quarter inches long; feeds

on the mast of beech and other trees; eggs yellowish, spotted.

3. F. Carduelis Goldfinch. Thistle-finch. Nine varieties.

- α. Quill feathers black, and (except the outmost) marked with fine yellow in the middle; two outmost tail-feathers white in the middle; the rest tipped with white.
- ϐ Region of the bill and eyes snowy.
- Head streaked with red or yellow.
- Head and neck black; bill spotted with red at the base.
- Whitish; front, cheeks, and chin red; wings and tail brown-ash.
- ζ. White; quill-feathers tipt with white.
- η. Black; middle tail-feathers sulphur.
- θ. Blackish; breast greenish; body beneath ashy; frontlet saffron.
- ι. Hybrid between the gold and canary-finch; body yellowish brown, beneath yellow; tail yellow, tipt with white.

Inhabits Europe, Asia, and Africa; sings exquisitely, and is very docile; frequents orchards, and feeds on various seeds; builds frequently in apple or pear-trees, and lays five white eggs, with deep purple spots on the upper end. Lives till about the age of twenty years.

4. F. Canaria. Canary-bird. Canary-finch. Two varieties.

- α. Bill and body straw-colour; quill and tail-feathers greenish.
- ϐ. Body above brown; eye-brows yellow.

Inhabits the Canary Islands; the second variety Africa. Was probably imported into Europe for the first time in the thirteenth or fourteenth century. Gesner is the first naturalist who mentions it. In the age of Aldrovannus it was esteemed a great rarity. Is easily tamed, and domesticated every where for its exquisite song; feeds on various seeds; chiefly hemp and Canary-grass; proves prolific with most other species of fringilla, and even with some which are of a different genus, as, for example, with emberiza citrinella or yellow-hammer. But the canary male is more shy than the female, and will associate with no female but of his own species. Its age extends to about fourteen or fifteen years.

5. F. Spinus. Siskin. Quill-feathers yellow in the middle, the first four without spots; tail-feathers yellow at the base and tipt with black. Three other varieties from difference or different distribution of colours. Inhabits our own country and Europe generally; four and three quarters inches long; feeds on various seeds; is easily tamed, and sings moderately. Called in the bird-shops aberdavine, and is said to have originated in Russia.

6. F. Cannabina. Greater Redpole. Chesnut-brown, beneath reddish-white; wings with a longitudinal white band; spot on the crown and breast red; bottom of the breast blood-red in the male, but in the female dirty-yellow. Inhabits Europe and America; five and half inches long. Easily tamed and cheerful.

7. F. Linota. Common Linnet. Chesnut-brown, beneath whitish; wings with a longitudinal white band; tail-feathers each side edged with white; bottom of the breast blood-red in the male, but in the female streaked with brown, pointing downwards. Inhabits Europe; five and a half inches long; feeds principally on hemp seeds, which it peels before it eats; sings delightfully; lays five whitish eggs with chesnut spots: breeds among furze and white thorn; the outside of the nest composed of furze and bents, and lined with wool and hair.

8. F. Montium. Twite. Mountain Linnet. Black, varied with reddish, beneath whitish; feathers of the lower part of the neck black in the middle; wings with a white band; rump red. Inhabits Europe; six and a half inches long. The female is without the red mark on the rump. It has no note, but merely twitters, whence its name.

9. F. Domestica. House-sparrow. Four varieties.

- α. Quill and tail-feathers brown; body grey and black; wings with a single white band.
- ϐ. White.
- γ. Yellow, above clouded with chesnut.
- δ. Blackish.

Inhabits Europe, Africa, and Asia; five and three quarters inches long; frequents inhabited places, and builds often under the eaves of thatched houses; feeds on seeds and fruits, and infests gardens; is proverbially salacious; eggs pale ash-colour; with thick set brown spots; is crafty, and not easily snared.

10. F. Petronia. Ring-sparrow. Grey; eye-brows white; chin pale yellow. Two other varieties from a trifling difference or different disposition in the colours. Inhabits Europe, especially Germany; five and three quarters inches long; feeds on insects, and builds in hollow trees.

FRI'PPERER. *s.* (from *frippier*, French.) One who deals in old things vamped up.

FRI'PPERY. *s.* (from *fripperie*, French.) 1. Places where old clothes are sold (*Howel*). 2. Old clothes; cast dresses; tattered rags.

To FRISK. *v. n.* (*frizzare*, Italian.) 1. To leap; to skip (*Locke*). 2. To dance in frolic or gayety (*L'Estrange*).

FRISK. *s.* (from the verb.) A frolic; a fit of wanton gayety.

FRI'SKER. *s.* (from *frisk.*) A wanton; one not constant or settled (*Camden*).

FRI'SKINESS. *s.* (from *frisk.*) Gayety; liveliness.

FRI'SKY. *a.* (*frisque*, French; from *frisk.*) Gay; airy.

FRIT, or FRITT, in the glass manufacture, is the matter or ingredients whereof glass is to be made, when they have been calcined or baked in a furnace. A salt drawn from the ashes of the plant kali, or from fern, or other plants, mixed with sand or flint, and baked together, makes an opaque mass called by the glass-men *frit*; probably, from the Italian *frittare*, to fry; or because the frit when melted

runs into lumps, like fritters, called by the Italians *fritelli*. Frit, by the ancients, was called *ammonitrum*, of αμμ@, *sand*, and νιτρον, *nitre*; under which name it is described by Pliny thus: Fine sand from the Volturnian sea, mixed with three times the quantity of nitre, and melted, makes a mass called *ammonitrum*; which being rebaked makes pure glass. Frit, Neri observes, is only the calx of the materials which make glass; which though they might be melted, and glass be made without thus calcining them, yet it would take up much more time. This calcining, or making of frit, serves to mix and incorporate the materials together, and to evaporate all the superfluous humidity. The frit, once made, is readily fused and turned into glass.

FRITH. *s.* (*fretum*, Latin.) 1. A strait of the sea where the water, being confined, is rough (*Dryden*). 2. A kind of net (*Carew*).

FRITH OF FORTH. See FORTH.

FRITILLARIA. Fritillary. In botany, a genus of the class hexandria, order monogynia; corol inferior, six-petalled, campanulate, with a nectariferous cavity above the claws; stamens as long as the corol; seeds flat. Six species; all of them bulbous rooted, flowering perennials, producing annual stalks nearly a yard high, ornamented with campanulate liliaceous flowers. Several are European plants, some supposed to have had a Persian origin, and one F. meleagris indigenous to the meadows of our own country. See Botany, plate CXVIII.

FRITILLARY. See FRITILLARIA.

FRITILLARY. (Crassa Major.) See STAPELIA.

FRITILLARY. (Crassa Minor.) See STAPELIA.

FRI'TINACY. *s.* (from *fritinio*, Latin.) The scream of an insect, as the cricket or cicada (*Brown*).

FRI'TTER. *s.* (*friture*, French.) 1. A small piece cut to be fried (*Tusser*). 2. A fragment; a small piece (*Bacon*). 3. A cheesecake; a wig (*Ainsworth*).

To FRI'TTER. *v. a.* (from the noun.) To cut meat into small pieces to be fried. 2. To break into small particles or fragments (*Pope*).

FRI'VOLOUS. *a.* (*frivolus*, Latin.) Slight; trifling; of no moment (*Roscommon*).

FRI'VOLOUSLY. *ad.* Triflingly; without weight.

FRI'VOLOUSNESS. *s.* Want of importance; triflingness.

FRIULI, a province of Italy, bounded on the N. by Carinthia, on the S. by the gulf of Venice, on the E. by the county of Goritz and the gulf of Trieste, and on the W. by Trevisano and the Bellunese. It is fertile in wine and fruits, and belongs partly to the Venetians, and partly to the house of Austria. Udina is the capital.

FRIZE, or FREEZE, a kind of woollen cloth for winter wear, being freezed or napped on one side.

FRIZE, in architecture. See FREEZE.

FRIZING *of cloth*, a term in the woollen manufactory, applied to the forming of the nap of a cloth, or stuff, into a number of little hard burrs, or prominences, covering almost the whole ground thereof. Frizing is best performed by a mill, the structure of which is as follows: the three principal parts are the frizer or crisper, the frizing table, and the drawer or beam. The two first are two equal planks or boards, each about 10 feet long, and 15 inches broad; differing only in this, that the frizing-table is lined or covered with a kind of coarse woollen stuff, of a rough sturdy nap; and the frizer is incrusted with a kind of cement composed of glue, gum arabic, and a yellow sand, with a little water, or urine. The beam, or drawer, thus called because it draws the stuff from between the frizer and the frizing-table, is a wooden roller, beset all over with little, fine, short points or ends of wire, like those of cards used in carding of wool.

The disposition and use of this machine is thus: the table stands immoveable, and bears or sustains the cloth to be frized, which is laid with that side uppermost on which the nap is to be raised: over the table is placed the frizer, at such a distance from it as to give room for the stuff to be passed between them: so that the frizer, having a very slow semicircular motion, meeting the long hairs or naps of the cloth, twists and rolls them into little knobs or burrs; while, at the same time, the drawer, which is continually turning, draws away the stuff from under the frizer, and winds it over its own points. All that the workman has to do while the machine is going, is, to stretch the stuff on the table as fast as the drawer takes it off, and from time to time to take off the stuff from the points of the drawer.

To FRI'ZLE. *v. a.* (*friser*, French.) To curl in short curls like nap of frieze (*Hakewill*).

FRI'ZLER. *s.* (from *frizle*.) One that makes short curls.

FRO. *ad.* (of ꝼɲa, Saxon.) Backward; regressively: *to* and *fro*, backward and forward, *to* and *from* (*Pope*).

FROBENIUS (John), a learned German printer, who flourished at Basil in the sixteenth century, and was greatly esteemed by Erasmus, whose works he printed, as he also did those of St. Augustine and Jerom. This useful man died in 1529, and left his business to his son Jerom Frobenius, and his son-in-law Nicholas Episcopius.

FROBISHER (sir Martin), an English navigator, was born near Doncaster in Yorkshire, and bred early to the sea. The spirit for nautical discovery being then at a great height, Frobisher was ambitious of gaining a name by finding the north-west passage, and being patronized by the earl of Warwick and other noblemen, he sailed from Deptford, June 8, 1576, and returned without having effected the principal object of his voyage, October 2 following. However he discovered some lands and straits, to one of which he gave his own name, and brought with him a lump of ore, which being found to contain gold, he was sent

a second time in a ship of the royal navy, attended by two barks, in 1577. Having procured what ore he could, he returned to England, and met with a gracious reception from his employers and the queen. Another voyage was undertaken, but the high expectations which had been formed respecting the gold mines vanished. In 1585 he served under sir Francis Drake in the West Indies, and in 1588 he commanded the Triumph, and had a share in the glorious defeat of the Spanish armada. The same year he was knighted on board of his own ship. This gallant officer was killed in assaulting the fort of Croyzon, near Brest, Nov. 7. 1594. His remains were brought to Plymouth, and there buried.

FROBISHER'S STRAITS, lie a little to the northward of Cape Farewell in West Greenland, and were discovered by sir Martin Frobisher. Lat. 63. 0 N. Lon. 42. W.

FROCK. *s.* (*froc*, French.) 1. A dress; a coat (*Milton*). 2. A kind of close coat for men (*Dryden*).

FRODINGHAM, a town in the East Riding of Yorkshire, with a market on Thursdays. Lat. 53. 56 N. Lon. 0. 12 E.

FRODSHAM, a town in Cheshire, with a castle at the W. end, and a market on Wednesdays. Lat. 53. 21 N. Lon. 2. 48 W.

FRŒLICHIA. In botany, a genus of the class tetrandia, order monogynia. Calyx superior, four-toothed; corol tubular; berry one-seeded, juiceless; seed arillate. One species; a shrub of the island Trinidad, with square branches; terminal panicle.

FROG. *s.* (ꝼꞃoꝫꝫa, Saxon.) In amphibiology. See RANA.

FROG, in the manage, the centrical horny substance at the bottom of a horse's foot, spreading wide from the heel, having a cleft in the middle, and terminating in a point toward the toe. To the internal parts is attached the lower extremity of the tendons, and the frog is the basis by which their elasticity is supported. The frog is subject to a disease called the frush, or thrush, which, when virulent, is termed running thrush; it sometimes arises from internal heat, by standing too much upon foul hot litter (particularly in the livery stables of the metropolis), and at others from a stagnant or torpid state of the fluids in the extremities, for want of proper exercise, leg-rubbing, and keeping the feet clean.

FROG-FISH, in ichthyology. See LOPHIUS.

FROISE. *s.* (from the French *froisser*.) A kind of food made by frying bacon enclosed in a pancake.

FRO'LIC. *a.* (*vrolijck*, Dutch.) Gay; full of levity; full of pranks (*Waller*).

FRO'LIC. *s.* A wild prank; a flight of whim and levity (*Roscommon*)

To FRO'LIC. *v. n.* To play wild pranks; to play tricks of levity and gayety (*Rowe*).

FRO'LICLY. *ad.* Gayly; wildly.

FRO'LICSOME. *a.* Full of wild gayety.

FRO'LICSOMELY. *ad.* With wild gayety.

FRO'LICSOMENESS. *s.* Wildness of gayety; pranks.

FROM. *prep.* (ꝼꞃam, Saxon.) 1. Away: noting privation: *his land was taken* from *him* (*Dryden*). 2. Noting reception; *I learned this* from *him* (*Pope*). 3. Noting procession, descent, or birth: *he came* from *kings* (*Blackmore*). 4. Noting transmission (*Shakspeare*). 5. Noting abstraction or vacation: *free* from *fault* (*Shakspeare*). 6. Noting succession: from *morning to night* (*Burnet*). 7. Out of: noting emission (*Milton*). 8. Noting progress from premises to inferences: from *dignity we infer honour* (*South*). 9. Noting the place or person from whom a message is brought (*Shaksp.*). 10. Out of: noting emission (*Milton*). 11. Because of; noting the reason or motive of an act: *he is lavish* from *kindness* (*Tillotson*). 12. Out of: noting the ground or cause of any thing: *earthquakes are* from *fire* (*Dryden*). 13. Not near to: noting distance (*Shakspeare*). 14. Noting separation or recession (*Dryden*). 15. Noting exemption or deliverance: *he is free* from *his pain* (*Prior*). 16. Noting absence (*Shakspeare*). 17. Noting derivation (*Dryden*). 18. Since: *we have been growing rich* from *the conquest* (*Tillotson*). 19. Contrary to: not in use (*Donne*). 20. Noting removal (*Dryden*). 21. *From* is frequently joined by an ellipsis with adverbs: as, *from above*, *from* the parts above (*Hooker*).

FROME, a river which rises in the S.W. part of Dorsetshire, and empties itself into the bay that forms the harbour of Poole.

FROME, a river in Somersetshire, which flows by the town of Frome, and unites with the Avon at Bristol.

FROME, a town of Somersetshire, with a market on Wednesdays. The article chiefly made here is second cloths, the principal material of which is fine English wool. This town contains 1709 houses, and 8748 inhabitants. Lat. 51. 10 N. Lon. 2. 16 W.

FRO'MWARD. *prep.* (ꝼꞃam and peaꞃd, Saxon.) Away from; the contrary to the word *toward*: not in use (*Sidney*).

FROND, FRONS: anciently written *fruns* (from βρύω *pullulo*, to germinate or bud); and signifying a twig of a tree with its leaves. Linnéus applies this term to the peculiar leafing of palms and ferns. He defines it to be a kind of trunk or stem, which has the branch united with the leaf, and frequently with the fructification.

FRONDESCENT, in botany, applied to the leafing season. The time of the year when plants unfold their leaves.

FRONDI'FEROUS. *a.* (*frondifer*, Latin.) Bearing leaves.

FRO'NDOUS, or FRONDO'SE, in botany, applied to the stem, means the stem of a palm, or fern; applied to the flower, it means a leafy proliferous flower. It sometimes happens in the rose, anemone, &c.

FRONS. (*frons*.) The forehead. The part between the eyebrows and the hairy scalp.

FRONT. *s.* (*frons*, Latin.) 1. The face (*Creech*). 2. The face of an enemy (*Daniel*).

3. The part or place opposed to the face. (*Bacon*). 4. The van of an army (*Milton*). 5. The forepart of any thing, as of a building (*Brown*). 6. The most conspicuous part or particular.

To FRONT. *v. a.* (from the noun.) 1. To oppose directly, or face to face; to encounter (*Dryden*). 2. To stand opposed, or over-against any place or thing (*Addison*).

To FRONT. *v. n.* To stand foremost (*Shakspeare*).

FRO'NTAL. *s.* (*frontale*, Latin.) Any external form of medicine to be applied to the forehead (*Quincy. Brown*).

FRONTAL, in architecture, a little pediment, sometimes placed over a small door or window.

FRONTAL BONE. *Os frontis.* The cockle-shell-like bone which forms the forehead, and contains the two anterior lobes of the brain. Its principal processes are the two superciliary arches, and two external and internal orbital apophyses. Its cavities are two orbital cavities, a notch for the trochlea of the superior oblique muscle, two large pituitary sinusses, one on each side above the root of the nose, called the frontal sinuses; the ethmoid notch, and superciliary foramen. In the fetus it is composed of two bones. The union of the frontal bone with the parietal bones forms the coronal suture.

FRONTAL SINUS. See FRONTAL BONE.

FRONTA'LIS, in myology. See OCCIPITO FRONTALIS.

FRONTALIS VERUS. See CORRUGATOR SUPERCILII.

FRO'NTATED. *a.* (from *frons*, Latin.) The *frontated* leaf of a flower grows broader and broader, and at last, perhaps, terminates in a right line; in opposition to *cuspated* (*Quincy*).

FRO'NTBOX. *s.* (*front* and *box.*) The box in the playhouse from which there is a direct view to the stage (*Pope*).

FRO'NTED. *a.* (from *front.*) Formed with a front (*Milton*).

FRO'NTIER. *s.* (*frontiere*, French.) The marches; the limit; the utmost verge of any territory; the border (*Milton*).

FRO'NTIER. *a.* Bordering (*Addison*).

FRONTIGNIAC, a town of France, in the department of Herault, and late province of Languedoc, remarkable for its excellent Muscadine wines. Lat. 43. 46 N. Lon. 3. 48 E.

FRONTINUS (Sextus Julius), an ancient Roman writer, was of consular dignity, and flourished under the emperors Vespasian, Titus, Domitian, Nerva, and Trajan. He commanded the Roman armies in Britain, was made city-prætor when Vespasian and Titus were consuls, and Nerva made him curator of the aqueducts, which occasioned his writing De aquæductibus urbis Romæ. He wrote four books upon the Greek and Roman art of war; a piece De re agraria, and another De limitibus. These have been often separately re-printed; but were all collected together in a neat edition at Amsterdam, in 1661, with notes, by Robertus Keuchenius. He died under Trajan.

FRO'NTISPIECE. *s.* (*frontispicium*, Lat.) That part of any building or other body that directly meets the eye (*Milton*). Hence, an engraving at the beginning of a book is called a frontispiece.

FRONTLESS. *a.* (from *front.*) Not blushing; wanting shame (*Dryden*).

FRO'NTLET. *s.* (from *frons*, Latin.) A bandage worn upon the forehead (*Wiseman*).

FRONTON, in architecture, a pediment.

FRO'NTROOM. *s.* (*front* and *room.*) An apartment in the forepart of a house (*Moxon*).

FRORE. *a.* Frozen: not in use (*Milton*).

FRORNE. *a.* Frozen: obsolete (*Spenser*).

FROST. (ꝼꞃoꞅꞇ.) 1. The last effect of cold; the power or act of congelation (*South*). 2. The appearance of plants and trees sparkling with congelation of dew (*Pope*).

FROST, such a state of the atmosphere as causes the congelation or freezing of water or other fluids into ice. In the more northern parts of the world, even solid bodies are affected by frost, though this is only or chiefly in consequence of the moisture they contain, which being frozen into ice, and so expanding as water is known to do when frozen, it bursts and rends any thing in which it is contained, as plants, trees, stones, and large rocks. Many fluids expand by frost, as water, which expands about $\frac{1}{10}$th part, for which reason ice floats in water; but others again contract, as quicksilver, and thence frozen quicksilver sinks in the fluid metal.

Frost, being derived from the atmosphere, naturally proceeds from the upper parts of bodies downwards, as the water and the earth: so, the longer a frost is continued, the thicker the ice becomes upon the water in ponds, and the deeper into the earth the ground is frozen. In about 16 or 17 days frost, Mr. Boyle found it had penetrated 14 inches into the ground. At Moscow, in a hard season, the frost will penetrate two feet deep into the ground: and Captain James found it penetrated 10 feet deep in Charlton Island, and the water in the same island was frozen to the depth of six feet. Sheffer assures us, that in Sweden the frost pierces two cubits, or Swedish ells into the earth, and turns what moisture is found there into a whitish substance, like ice; and standing water to three ells or more. The same author also mentions sudden cracks or rifts in the ice of the lakes of Sweden, nine or ten feet deep, and many leagues long; the rupture being made with a noise not less loud than if many guns were discharged together. By such means, however, the fishes were furnished with air; so that they are rarely found dead.

The natural history of frosts furnishes very extraordinary effects. The trees are often scorched and burnt up, as with the most excessive heat, in consequence of the separation of water from the air, which is therefore very drying. In the great frost in 1683, the trunks of oak, ash, walnut, &c. were miserably split and cleft,

so that they might be seen through, and the cracks often attended with dreadful noises like the explosion of fire-arms. Philos. Trans. Number 165.

The close of the year 1708, and the beginning of 1709, were remarkable throughout the greatest part of Europe, for a severe frost. Dr. Derham says, it was the greatest in degree, if not the most universal in the memory of man; extending through most parts of Europe, though scarcely felt in Scotland or Ireland.

In very cold countries, meat may be preserved by the frost six or seven months, and prove tolerably good eating. See captain Middleton's observations made in Hudson's Bay, in the Philos. Trans. Number 465, sect. 2.

In that climate the frost seems never out of the ground, it having been found hard frozen in the two summer months. Brandy and spirits, set out in the open air, freeze to solid ice in three or four hours.

Lakes and standing waters, not above 10 or 12 feet deep, are frozen to the ground in winter, and all their fish perish. But in rivers where the current of the tide is strong, the ice does not reach so deep, and the fish are preserved. Id. ib.

Some remarkable instances of frosts in Europe, and chiefly in England, are recorded as below; in the year

220. Frost in Britain that lasted five months.
250. The Thames frozen nine weeks.
291. Most rivers in Britain frozen six weeks.
359. Severe frost in Scotland for 14 weeks
508. The rivers in Britain frozen for two months.
558. The Danube quite frozen over.
695. Thames frozen six weeks; booths built on it.
759. Frost from Oct. 1, till Feb. 26, 760.
827. Frost in England for nine weeks
859. Carriages used on the Adriatic Sea.
908. Most rivers in England frozen two months.
923. The Thames frozen 13 weeks.
987. Frost lasted 120 days: began Dec. 22.
998. The Thames frozen five weeks.
1035. Severe frost on June 24: the corn and fruits destroyed.
1063. The Thames frozen 14 weeks.
1076. Frost in England from Nov. till April.
1114. Several wooden bridges carried away by ice.
1205. Frost in England from Jan. 14, till March 22.
1407. Frost that lasted 15 weeks.
1434. From Nov. 24, till Feb. 10, Thames frozen down to Gravesend.
1683. Frost for 13 weeks.
1708-9. Severe frost for many weeks.
1715. The same for many weeks.
1739. One for nine weeks: began December 24.
1742. Severe frost for many weeks.
1747. Severe frost in Russia.
1751. Severe one in England.
1760. The same in Germany.
1776. The same in England.
1788. The Thames frozen below bridge; booths on it.
1794. Hard frost of many weeks. Ther. at London, mostly at 20 below 0 of Fahrenheit.

Hoar frost, is the dew frozen or congealed early in cold mornings; chiefly in autumn. Though many Cartesians will have it formed of a cloud; and either congealed in the cloud, and so let fall; or ready to be congealed as soon as it arrives at the earth.

Hoar frost, M. Regius observes, consists of an assemblage of little parcels of ice crystals, which are of various figures, according to the different disposition of the vapours, when met and condensed by the cold. See FREEZING, and CONGELATION.

Frost, as is well known, is particularly destructive to the blossom of fruit-trees; and the following method of securing such trees from being damaged by early frosts may be acceptable to many of our readers. A rope is to be interwoven among the branches of the tree, and one end of it brought down so as to be immersed in a bucket of water. The rope, it is said, will act as a conductor, and convey the effects of the frost from the tree to the water. This idea is not new; for the following passage may be found in Colerus: "If you dig a trench around the root of a tree, and fill it with water, or keep the roots moist till it has bloomed, it will not be injured by the frost. Or, in spring, suspend a vessel filled with water from the tree. If you wish to preserve the bloom from being hurt by the frost, place a vessel of water below it, and the frost will fall into it." Philosophical Magazine, No. 11.

An anonymous foreign writer suggests the practice of depriving, towards the latter end of autumn, those fruit-trees of their leaves, which are exposed to the injury of winter-frosts; and adds, that some precaution is necessary in this operation, to save the buds which are by nature destined to unfold in the succeeding spring from any external injury. Yet such defoliation ought not to be undertaken with all trees, at the same period of time; as those which possess a greater abundance of sap, should be allowed to keep their leaves to a later season, than others having a less portion of vegetable juices.

In order to recover and preserve such trees from total decay, as have evidently been injured by severe winter-frost, a correspondent has favoured us with the following easy and expeditious remedy; for the success of which he appeals to his repeated experience: When a tree appears to have suffered from intense cold, he advises to make longitudinal incisions in the bark, extending to the whole length of the trunk, on the north, west, and east sides; but never in a southern direction. As the east-winds are dry and piercing, very few and superficial slits only should be made on that side.

This operation ought to be performed in the month of March, before the first sap rises; and repeated in June, while the second sap ascends; but always so managed, that only the uppermost bark, or epidermis, be divided; as too deep an incision, though harmless in the spring, might be attended with fatal consequences in the heat of summer. In trees, however, which are thoroughly frozen, it will be useful to make deeper cuts; thus to give vent to the stagnant fluids, and promote their circulation. These cuts should be directed against the centre of the tree, drawn in a straight line downwards; for, in the contrary case, the bark is apt to separate in chinks, afford shelter to vermin, and eventually frustrate the attempt. By a strict adherence to these rules, it will be found that apple-trees, in particular, when slit in every direction (except the south side) retain all their bark; others, which had undergone one-half of the operation, were but partially preserved; and such as had received only two cuts, retained only the intermediate portion of the bark, from which they produced new shoots. This simple method is farther attended with the additional benefit that, while contributing to the growth of the tree thus affected, it tends to prevent the decay of those which have in the preceding year been injured by the depredations of caterpillars, and the subsequent stagnation of their fluids.

Although it has been generally believed, that frost meliorates the soil, and especially clay-lands, yet as ice contains no nitrous particles, such improvements can only be of a transitory nature, by enlarging the bulk of some moist soils, and leaving them more porous for some time after the thaw; but, when the water has exhaled, the ground becomes as hard as before, being compressed by the incumbent weight of the air.

Nor is the salutary influence of frosty seasons, on the health of mankind, in the least confirmed by the annual bills of mortality; as many old and debilitated persons, whose vital heat is insufficient to excite into action their vessels, already too unsusceptible of irritation, die in consequence of long frosts, during severe winters. Birds, and other wild animals, as well as tender vegetables, perish benumbed from the same cause. It deserves, however, to be remarked, that a sharp dry frost does not affect the human skin with that sensation of chilly and piercing cold which we experience when the air is loaded with moisture, the temperature of which is near the freezing point. This remarkable difference arises from the intense degree of cold produced by the evaporation of fluids which continually takes place on the surface of living bodies, where it naturally produces a more perceptible effect, than the simple contact of dry air would occasion, when it is but a few degrees below freezing. To the young and robust, therefore, frost is more pleasing than moist air; as, in the former, they are able to keep themselves warm by increased exercise; which, in the latter, only tends to promote and render the evaporation more severely felt on the skin. For the same reason, Dr. Darwin observes, severe and continued frosts "destroy the children of the poor, who want both food, fire, and clothing in this harsh climate."

To preserve vegetable roots, as well as fruit, from the effect of cold, the following directions will be sufficient: Dry sand, and cut straw, are eminently adapted to that purpose. Potatoes, turnips, onions, &c. should be loosely placed on sand, either under or above ground, and slightly covered with cut straw or chaff; but carrots and parsnips, we are informed, may be kept during the whole winter, by placing them in rows or heaps, so that their tops project at the sides, being the reverse of the method followed with turnips when packed in carts.

If, notwithstanding these precautions, vegetables should be injured by the frost, it will be advisable, especially with frozen potatoes, to immerse them in cold water for a short time, on the approach of a thaw. By this expedient, the frosty particles are gradually extracted, and the vegetating principle is preserved, after the severest season.

On the other hand, an intense degree of cold is also attended with some good effects. Thus, aromatic spirits possess a weaker flavour when newly distilled, than after they have been kept six or seven months, especially during the winter season. Experience has evinced, that this favourable change was produced only by the influence of cold; and M. Baume found, that by immersing quart bottles filled with liquors into a mixture of pounded ice and sea-salt, for six or eight hours, the spirit proves as grateful to the palate as that which had been kept for several years.

FRO'STBITTEN. *a.* Nipped or withered by the frost (*Mortimer*).

FRO'STED. *a.* Laid on in inequalities like those of the hoar-frost from plants (*Gay*).

FRO'STILY. *ad.* (from *frosty.*) 1. With frost; with excessive cold. 2. Without warmth of affection (*Ben Jonson*).

FRO'STINESS. *s.* (from *frosty.*) Cold; freezing cold.

FRO'STNAIL. *s.* (*frost* and *nail.*) A nail with a prominent head driven into the horse's shoes, that it may pierce the ice (*Grew*).

FRO'STWORK. *s.* (*frost* and *work.*) Work in which the substance is laid on with inequalities, like the dew congealed upon shrubs (*Blackmore*).

FRO'STY. *a.* (from *frost.*) 1. Having the power of congelation; excessive cold (*L'Estrange*). 2. Chill in affection; without warmth of kindness or courage (*Shakspeare*). 3. Hoary; gray-haired; resembling frost (*Shakspeare*).

FROTH. *s.* (*froe*, Danish and Scottish.) 1. Spume; foam; the bubbles caused in liquors by agitation (*Bacon*). 2. Any empty or senseless show of wit or eloquence. 3. Any thing not solid or substantial (*Tusser*).

FROTH, from a horse's mouth when champing upon the bit, either in action upon the road, or in the field with hounds, may be con-

sidered a distinguishing, and almost invariable sign of good spirit and sound bottom; for a dull jade, or a horse of the sluggish cart-breed, is very rarely to be seen with this appearance. It is also no indifferent criterion of health, and may, in general, be regarded as truly indicative of condition: few, if any, horses of this description flag upon a journey, or tire in the field.

To FROTH. *v. n.* (from the noun.) To foam; to throw out spume (*Dryden*).

FRO'THILY. *ad.* (from *frothy.*) 1. With foam; with spume. 2. In an empty trifling manner.

FRO'THY. *a.* (from *froth.*) 1. Full of foam, froth, or spume (*Bacon*). 2. Soft; not solid; wasting (*Bacon*). 3. Vain; empty; trifling (*L'Estrange*).

FROUNCE. *s.* A distemper in which white spittle gathers about the hawk's bill (*Skinner*).

To FROUNCE. *v. n.* To frizzle or curl the hair about the face (*Ascham*).

FRO'UZY. *a.* (A cant word.) 1. Fetid; musty (*Swift*). 2. Dim; cloudy (*Swift*).

FRO'WARD. *a.* (ꝼpampeapꝺ, Saxon.) Peevish; ungovernable; angry (*Temple*).

FRO'WARDLY. *ad.* (from *froward.*) Peevishly; perversely (*Isaiah*).

FRO'WARDNESS. *s.* (from *froward.*) Peevishness; perverseness (*South*).

FROWER, a tool used in cleaving laths.

To FROWN. *v. a.* (*frogner*, old French.) To express displeasure by contracting the face to wrinkles; to look stern (*Pope*).

FROWN. *s.* A wrinkled look; a look of displeasure (*Shakspeare*).

FRO'WNINGLY. *ad.* (from *frown.*) Sternly; with a look of displeasure (*Shakspeare*).

FRO'WY. *a.* Musty; frouzy (*Spenser*).

FRO'ZEN. part. pass. of *freeze.* 1. Congealed with cold (*Dryden*). 2. Chill in affection (*Sidney*). 3. Void of heat or appetite (*Pope*).

F. R. S. *Fellow* of the *Royal Society*.

FRUCTESCENT, in botany, applied to the fruiting season; the time when vegetables scatter their ripe seeds.

FRUCTI'FEROUS. *a.* (*fructifer*, Latin.) Bearing fruit.

FRUCTIFICATION, in botany, fruiting, a temporary part of vegetables, appropriated to generation, terminating the old and beginning the new vegetable. The essence of it consists in the flower and fruit; and there is no fructification without anther, stigma, and seed. When perfect it consists of seven parts. 1. Calyx. 2. Corol. 3. Stamen. 4. Pistil. 5. Pericarp. 6. Seed. 7. Receptacle. Of these the four first belong to the flower; the two next to the fruit; and the last is common to both.

FRUCTIFICA'TION. *s.* (from *fructify.*) The act of causing or of bearing fruit; fecundation; fertility (*Brown*).

To FRU'CTIFY. *v. a.* (*fructifier*, French.) To make fruitful; to fertilize (*Granville*).

To FRU'CTIFY. *v. n.* To bear fruit (*Hook.*).

FRU'CTUOUS. *a.* (*fructueux*, French.) Fruitful; fertile; impregnating with fertility (*Philips*).

FRUCTUS HORÆI. See FRUITS (Summer).

FRU'GAL. *a.* (*frugalis*, Latin.) Thrifty; sparing; parsimonious (*Dryden*).

FRU'GALLY. *ad.* Parsimoniously; sparingly; thriftily (*Dryden*).

FRUGA'LITY. *s.* (*frugalité*, Fr.) Thrift; parsimony; good husbandry (*Bacon*).

FRUGI'FEROUS. *a.* (*frugifer*, Latin.) Bearing fruit (*Ainsworth*).

FRUIT. *s.* (*fruit*, French.) 1. The product of a tree or plant in which the seeds are contained (*Shakspeare*). 2. That part of a plant which is taken for food (*Davies*). 3. Production (*Ephesians*). 4. The offspring of the womb (*Sandys*). 5. Advantage gained by any enterprise or conduct (*Swift*). 6. The effect or consequence of any action (*Proverbs*).

FRUIT. Fructus. The seed with its pericarp. It is a fruit, however, whether there be a pericarp or not.

FRUIT-STALK. See PEDUNCULUS.

FRUITS (Summer). Fructus horæi. Under this term physicians comprehend strawberries, cherries, currants, mulberries, rasberries, and the like. They possess a sweet sub-acid taste, and are exhibited as dietetic auxilliaries, as refrigerants, antiseptics, attenuants, and aperients. Formerly they were exhibited medicinally in the cure of putrid affections, and to promote the alvine and urinary excretions. Considering them as an article of diet, they afford little nourishment, and are liable to produce flatulencies. To persons of a bilious constitution and rigid fibres, and where the habit is disposed naturally, or from extrinsic causes, to an inflammatory or putrescent state, their moderate, and even plentiful use, is salubrious; by those of a cold inactive disposition, where the vessels are lax, the circulation languid, and the digestion weak, they should be used very sparingly. The juices extracted from these fruits by expression, contain their active qualities freed from their grosser indigestible matter. On standing, the juice ferments and changes to a vinous or acetous state. By the proper addition of sugar, and by boiling, their fermentive power is suppressed, and their medicinal qualities preserved. The juices of these fruits, when purified from their feculencies by settling and straining, may be made into syrups, with a due proportion of sugar in the usual way.

FRU'ITAGE. *s.* (*fruitage*, French.) Fruit collectively; various fruits (*More*).

FRU'ITBEARER. *s.* (*fruit* and *bearer.*) That which produces fruit (*Mortimer*).

FRU'ITBEARING. *a.* (*fruit* and *bear.*) Having the quality of producing fruit (*Mortimer*).

FRU'ITERER. *s.* (*fruitier*, French.) One who trades in fruit (*Shakspeare*).

FRU'ITERY. *s.* (*fruiterie*, French.) 1. Fruit collectively taken (*Philips*). 2. A fruit-loft; a repository for fruit.

FRU'ITFUL. *a.* (*fruit* and *full.*) 1. Fertile; abundantly productive, liberal of vegetable

product (Sidney). 2. Actually bearing fruit (Shakspeare). 3. Prolific; childbearing; not barren (Shakspeare). 4. Plenteous; abounding (Addison).

FRU'ITFULLY. *ad.* 1. In such a manner as to be prolific (Rosc). 2. Plenteously; abundantly (Shakspeare).

FRU'ITFULNESS. *s.* (from *fruitful.*) 1. Fertility; fecundity; plentiful production (Raleigh). 2. The quality of being prolific (Dryden). 3. Exuberant abundance (Ben Jonson).

FRUITGRO'VES. *s.* (*fruit* and *groves.*) Shades, or close plantations of fruit-trees (Pope).

FRUI'TION. *s.* (*fruor*, Lat.) Enjoyment; possession; pleasure given by possession or use (Rogers).

FRU'ITIVE. *a.* (from the noun.) Enjoying; possessing: not used (Boyle).

FRU'ITLESLY. *ad.* (from *fruitless.*) Vainly; idly; unprofitably (Dryden).

FRU'ITLESS. *a.* (from *fruit.*) 1. Barren of fruit; not bearing fruit (Raleigh). 2. Vain; productive of no advantage; idle; unprofitable (Milton). 3. Having no offspring (Shaksp.).

FRUIT-TIME. *s.* The autumn; the time for gathering fruit.

FRUIT-TREE. *s.* A tree of that kind whose principal value arises from the fruit produced by it (Waller).

FRUMENTA'CIOUS. *a.* (from *frumentum*, Latin.) Made of grain, or having the properties or qualities of grain.

FRUMENTARII, soldiers or archers under the western empire, who were also purveyors to the armies.

FRUMENTATION, in Roman antiquity, a largess of corn bestowed on the people.

FRUME'NTY. *s.* (*frumentum*, corn, Latin.) Food made of wheat boiled in milk.

To FRUMP. *v. a.* To mock; to browbeat.

FRUMSTOL, in our old writers, the mansion-house.

To FRUSH. *v. a.* (*froisser*, Fr.) To break, bruise, or crush (Shakspeare).

FRUSH, among farriers, the frog of a horse's foot: whence it is also used to denote a disease in the centrical cleft of the frog, at the bottom of the foot; a disease more generally known, however, under the denomination of THRUSH, which see, as also FROG.

FRUSTRA'NEA. (*frustra*, in vain.) Polygamia. The name of the third order in the class syngenesia of Linnéus's Artificial System; comprehending such of the compound flowers as have perfect florets in the disk, producing seed; but imperfect florets in the ray, which for want of a stigma are barren.

FRUSTRA'NEOUS. *a.* (*frustra*, Latin.) Vain; useless; unprofitable (More).

To FRU'STRATE. *v. a.* (*frustror*, Latin.) 1. To defeat; to disappoint; to balk (Hooker). 2. To make null; to nullify (Spenser).

FRU'STRATE. *part. a.* (from the verb.) 1. Vain; ineffectual; unprofitable (Raleigh). 2. Null; void (Hooker).

FRUSTRA'TION. *s.* (*frustratio*, Latin.) Disappointment; defeat (South).

FRU'STRATIVE. *a.* (from *frustrate*) Fallacious; disappointing (Ainsworth).

FRU'STRATORY. *a.* (from *frustrate.*) That makes any procedure void (Ayliffe).

FRUSTUM, in geometry, is the part of a solid next the base, left by cutting off the top, or segment, by a plane parallel to the base: as the frustum of a pyramid, of a cone, of a conoid, of a spheroid, or of a sphere, which is any part comprised between two parallel circular sections; and the middle frustum of a sphere, is that whose ends are equal circles, having the centres of the sphere in the middle of it, and equally distant from both ends.

For the solid content of the frustum of a cone, or of any pyramid, whatever figure the base may have.—Add into one sum, the areas of the two ends and the mean proportional between them; then $\frac{1}{3}$ of that sum will be a mean area, or the area of an equal prism, of the same altitude with the frustum; and consequently that mean area being multiplied by the height of the frustum, the product will be the solid content of it. That is, if A denote the area of the greater end, a that of the less, and h the height; then $\overline{A + a + \sqrt{Aa}} \times \frac{1}{3}h$ is the solidity.

Other rules for pyramidal or conic frustums may be seen in Hutton's Mensuration, p. 189, 2d edit. 1788.

The curve surface of the zone or frustum of a sphere, is had by multiplying the circumference of the sphere by the height of the frustum. Hutton's Mensuration, p. 197.

And the solidity of the same frustum is found, by adding together the squares of the radii of the two ends, and $\frac{1}{3}$ of the square of the height of the frustum, then multiplying the sum by the said height and by the number 1·5708. That is, $\overline{R^2 + r^2 + \frac{1}{3}h^2} \times \frac{1}{2} p h$ is the solid content of the spheric frustum, whose height is h, and the radii of its ends R and r, p being $= 3{\cdot}1416$. Mensur. p. 209.

For the frustums of spheroids, and conoids, either parabolic or hyperbolic, see Hutton's Mensuration, p. 326, 328, 332, 382, 435.

FRUTESCENT, in botany, applied to the stem: as a frutescent stem. From herbaceous becoming shrubby.

FRUTEX, in botany, a shrub.

FRUTINGEN, a town of Swisserland, in the canton of Bern. It gives name to a bailiwic, and is esteemed one of the most beautiful places in Swisserland. It is 30 miles S. E. of Friburg.

FRY. *s.* (from *froe*, foam, Danish, Skinner.) 1. The swarm of little fishes just produced from the spawn (Donne). 2. Any swarm of animals; or young people in contempt (Oldham).

FRY. *s.* A kind of sieve (Mortimer).

To FRY. *v. a.* (*frigo*, Latin.) To dress food by roasting it in a pan on the fire.

To FRY. *v. n.* 1. To be roasted in a pan on the fire. 2. To suffer the action of fire (Dryden). 3. To melt with heat (Waller). 4. To be agitated like liquor in the pan on the fire (Bacon).

FRY *s.* (from the verb.) A dish of things fried.

FRY'INGPAN. *s.* (*fry* and *pan.*) The vessel in which meat is roasted on the fire (*Addison*).

FRYTH, or FRITH, a plain between two woods: it also denotes an arm of the sea, as the Frith of Forth, the Frith of Clyde, &c.

FUAGE, a tax of 12*d.* for every fire, levied in the time of Edward III.

To FUB. *v. a.* To put off. See FOB. (*Shakspeare*).

FUB. *s.* A plump chubby boy (*Ainsworth*).

FU'CATED. *a.* (*fucatus*, Latin.) 1. Painted; disguised with paint. 2. Disguised by false show.

FUCHSIA. In botany, a genus of the class octandria, order monogynia. Calyx four-parted, coloured, bearing the corol; corol four petalled, berry inferior, four-celled, many-seeded. Five species; all of South America, except F. exserticata, which is a native of New Zealand, with leaves a little hoary underneath; peduncles solitary; flowers pendulous; corol with an eight cleft border, every other segment lanceolate and spread; the rest erect and only a third of the size. The plant most usually cultivated among ourselves is F. coccinea, a native of Chili, and exquisitely beautiful and elegant. It is usually found with perennial stalks in our green-houses: but it will bear being planted abroad, only that in this situation it parts with its stalks every winter, which nevertheless are renewed every spring. See Botany, Pl. CX.

F. lycioides, or box-thorn fuchsia, is also well deserving of cultivation on account of its great beauty. It is a native of Chili, and requires with us the protection of a green-house; for when the stem is destroyed by the frost the root usually perishes with it. The first specimen of it in this country flowered in the royal garden at Kew in 1796. It is readily propagated by cuttings of the young shoots set in a hot-bed in March.

FUCUS, a name given by the ancients to certain dyes and paints. By this name they called a purple sea-plant used by them to die woollen and linen cloths of that colour. The dye was very beautiful, but not lasting; for it soon began to change, and in time went wholly off. This is the account Theophrastus gives of it.

The women of those times also used something called fucus to stain their cheeks red; and many have supposed, from the same word expressing both, that the same substance was used on both occasions. But this, on a strict inquiry, proves not to be the case. The Greeks called every thing fucus, that would stain or paint the flesh. But this peculiar substance, used by the women to paint their cheeks, was distinguished from the others by the name of *rizion* among the more correct writers, and was indeed a root brought from Syria into Greece. The Latins, in imitation of the Greek name, called this root *radicula*; and Pliny very erroneously confounds the plant with the *radix lunaria*, or *struthion* of the Greeks.

The word fucus was in those times become such an universal name for paint, that the Greeks and Romans had a *fucus metallicus*, which was the cerus used for painting the necks and arms white; after which they used the *purpurissum*, or red fucus of the *rixium*, to give the colour to the cheeks. In after-times they also used a peculiar fucus or paint for the purpose, prepared of the *Creta argentaria*, or silver-chalk, and some of the rich purple dyes that were in use at that time; and this seems to have been very little different from our rose-pink; a colour commonly sold at the colour-shops.

FUCUS. Sea-wrack. In botany, a genus of the class cryptogamia, order algæ. Seeds produced in clustered tubercles, which burst at their summits. A hundred and forty-six species, of which eighty are common to the coasts of our own country. We can enumerate only a few: see Botany, Pl. CIX. CXVIII.

1. F. palmatus. Palmated fucus, dilse or dulse. Membranous, glabrous on both sides, palmate; segments oblong, nearly simple, very frequent on the coasts of Scotland and the Hebrides: membranaceous, thin and pellucid; of a red hue or red mixed with green: length from three inches to a foot; gradually dilated from the base upwards in the shape of a fan. It is often eaten as an esculent, both raw and boiled, and contains much alkali, a considerable portion of sugar, and a large quantity of mucus.

2. F. natans. Floating fucus. Filiform, compressed, pinnate; leaves oblong lanceolate serrate; vesicles globular, peduncled, scattered on flat dilated peduncles. Found often on the surface of the sea, spreading to a prodigious extent, and producing tranquillity on its surface, except when agitated by variable winds.

3. F. serratus. Serrated sea-wrack or fucus. Linnear, forked, serrate-toothed, cloven and flat at the tips; barren ones obtuse, fertile and acute. It is infested, as are most of the fucus genus, with a species of coralline. In this case the species is the sertularia pumila of Linnéus, which is frequently found creeping along the leaf.

4. F. vesiculosus. Common sea-wrack; bladder sea-wrack; sea-ware. Linear, forked, entire; with globular, innate, and axillary vesicles, cloven at the tips; barren ones flat, fertile ones humid. It produces its fructifications like the last in July or August; hues and habits the same. It is used as a manure of most excellent quality on the sea-coasts of Scotland and in the Scottish islands. In the last it also serves as food for cattle, who are fond of it: it is mucous and saccharine. In Sweden it is dried, and serves both for fuel and for thatch. In all parts where it is largely obtained it is of high value from the alkali it contains; and hence when burnt to ashes it affords the best kelp. The price of this in June is 3*l.* 10*s.* per ton, and about forty or

fifty tons are exported from this island annually

5. F. prolifer Proliferous sea-wrack. Frondescent, green, with ovate, flat, proliferous joints, of a red colour. The length of the plant is about four or five inches, the breadth of the leaf about a quarter of an inch. Its growth is peculiarly worthy of attention. It has no root, and originates leaf from leaf, consisting, like the cactus opuntia, of leaves alone, independently of the fructification. This last is a red spherical rough wart, less than the smallest pin's head, scattered without order on the surface of the leaves. They drop off and unfold themselves into primary or parent leaves. This plant is also much infested with coralline worms; of which the chief are the mandrepora vermiaria, and flustra pilosa.

6. F. saccharinus. Sweet fucus; sugar sea-wrack; sea-belt. Leathery, simple, sword-shaped, on a round, rigid stem. It consists therefore of one linear, elliptic leaf, of a tawny-green colour, from five feet to five yards in length, and about three inches wide. The stalk, from which it springs, from two inches to a foot. The root is composed of branched fibres which adhere to the stones, to which it fixes like claws. This plant is also frequently troubled with the sertula ciliaria. It is less esteemed in our own country than some other species: but in Iceland it is used as an esculent both for man and beast.

7. F. ciliatus. Ciliate, or ligulate fucus. Membranous, tough, pinnate; clothed and fringed with scattered, subulate, mostly simple processes; bearing the seeds in a globular tubercle. It is found occasionally on our own coasts, and esteemed an esculent by the Scots and Irish: it is found more generally on the Mediterranean coasts.

8. F. pinnatifidus. Pepper-dilse; jagged sea-wrack. Cartilaginous, branched; branches nearly alternate, doubly pinnatifid; segments obtuse, callous, with ovate, sessile tubercles. Colour yellow olive, tinged with red. It has a hot peppery taste, which is common to the maritime inhabitants of Scotland where it is used as an esculent: and hence its name.

9. F. esculentus. Eatable sea-wrack; tangle; bladder-locks. The stalk eaten more commonly both by man and beast than any part of any other fucus: the leaf and membranous parts however are rejected uniformly. Simple, undivided, uniform; on a pinnate stalk; divisions two-rowed, oblong, veinless. It is often recommended as a stomachic in medicine, and is said to be very useful in this character.

10. F. plicatus. Matted, implicated, or Indian-grass fucus. Capillary, uniform, much-branched, entangled, nearly transparent. From three to six inches long; colour when exposed to the air and light yellowish or auburn; viscid, semipellucid, tough, and horny, resembling the Indian grass, as it is called by anglers, which they obtain from the tendrils issuing from the ovary of the dog-fish.

11. F. spiralis. Spiral fucus. Frond linear, dichotomous, spiral, entire with a central rib; the fructifying extremities cloven, rounded and obtuse. Perhaps a species of F. vesiculosus, though ranked separately in vol. iii. of the Transactions of the Linnean Society: found in our own country on stones and planks, growing about high-water mark, and always in such situations as to be exposed to the air after every tide.

12. F. membranaceus. Pellucid fucus. Frond linear, forked, membranous, pellucid, greenish-brown. Midrif slightly prominent, here and there proliferous. Fruit in convex superficial dots. Found in our own country on the Devonshire and Scottish coasts.

13. F. articulatus. Jointed fucus. Frond tubular, regularly contracted at intervals as if jointed, much branched; joints elliptical; branches forked and whorled. Common to the coasts of Britain and Ireland.

14. F. confervoides. Warty fucus. Frond thread-shaped, branched, purplish; branches unequal, mostly leaning one way, tapering at each end. Tubercles hemispherical, lateral, sessile, acute. Found on our own coasts, and sometimes confounded with F. flagelliformis.

To FU'DDLE. *v. a.* To make drunk (*Thomson.*)

To Fu'ddle. *v. n.* To drink to excess (*L'Estrange.*)

FUEGO, or Fogo, one of the Cape de Verd islands, in the Atlantic ocean. It is much higher than any of the rest, and seems at sea to be one single mountain though on the sides there are deep valleys. There is a volcano at the top of it, which burns continually, and may be seen a great way off at sea. It vomits a great deal of fire and smoke, and throws out huge pieces of rock to a vast height; and sometimes torrents of brimstone run down the sides. The Portuguese, who first inhabited it, brought negroes with them, and a stock of cows, horses, and hogs; but the chief inhabitants now are blacks, of the Romish religion. Lat. 14. 54 N. Lon. 24. 30 W.

Fuego, or Terra del Fuego, a large island, separated from the southern extremity of America by a narrow sea, called the Straits of Magellan; so called from the volcanoes observed on it. The aspect of the country is represented as dreary and uncomfortable, consisting of a chain of stupendous rocks, and continually covered with snow. Along the coasts are a great number of inlets, or harbours, for the largest ships, with rocks near the shore, which, however, may be discovered by sounding. The inhabitants are said to be naturally as fair as Europeans, but that they go naked, and paint their bodies with the most gorgeous colours. Those on the south side are said to be uncivilized, treacherous, and barbarous; while those on the opposite side are simple, affable, and perfectly harmless. The skins of wild animals are sometimes used to cover their bodies, upon occasion of extraordinary pomp, and their tents are made of poles, disposed in a conical form, covered with skins, or the bark or leaves of trees. Sir Joseph Banks, Dr. Solander, and some others, landed here in the

month of January, 1768, which is the time of summer in that part of the globe, notwithstanding which two of the company fell a sacrifice to the cold only by sleeping one night, and Dr. Solander himself hardly escaped. Lat. 52. 30 to 55. 35 S. Lon. 69 to 76 W.

FU'EL. *s.* (from *feu*, fire, French.) The matter or aliment of fire (*Prior*).

To FUEL. *v. a.* (from the noun.) 1. To feed fire with combustible matter (*Donne*). 2. To store with firing (*Walton*).

FUE'ILLEMORTE. (French.) Corruptly pronounced and written *philomot*. Brown, like a withered leaf in autumn (*Locke*).

FUEN-HOA, a city of China, in the province of Pe-tcheli, celebrated for its extent and the number of its inhabitants, as well as for the beauty of its streets and triumphal arches. It is situated near the great wall, amidst mountains; and has under its jurisdiction, besides two cities of the second and eight of the third class, a great number of fortresses, which bar the entrance of China against the Tartars.

FUEN-TCHEOU-FOU, a commercial city of China, in the province of Chang-si. Its baths and springs, almost as hot as boiling water, attract a great number of strangers. Its district contains one city of the second, and seven of the third class.

FUGA'CIOUS. *a.* (*fugax*, Lat.) Volatile.

FUGA'CIOUSNESS. *s.* Volatility; the quality of flying away.

FUGA'CITY. *s.* (*fugax*, Latin). 1. Volatility; quality of flying away (*Boyle*). 2. Uncertainty; instability.

FUGALIA, a Roman festival, held annually in honour of Fugia, the goddess of joy.

FUGH. *interj.* An expression of abhorrence. Commonly *foh* (*Dryden*).

FU'GITIVE. *a.* (*fugitivus*, Latin.) 1. Not tenable; not to be held or detained. 2. Unsteady; unstable; not durable. 3. Volatile; apt to fly away (*Woodward*). 4. Flying; running from danger (*Milton*). 5. Flying from duty; falling off (*Clarissa*). 6. Runagate; vagabond (*Wotton*).

FU'GITIVE. *s.* (from the adjective.) 1. One who runs from his station or duty (*Den.*). 2. One who takes shelter under another power from punishment (*Dryden*). 3. One hard to be caught or detained (*Harte*).

FU'GITIVENESS. *s.* (from *fugitive.*) 1. Volatility; fugacity (*Boyle*). 2. Instability; uncertainty.

FUGUE, in music (from *fuga*, a chase), a composition in which one part leads off some determined succession of notes, and, after successive short intervals of time, other parts fly after it, as it were, repeating notes in a similar order, but at the distance of a fifth or octave: the whole being rendered consistent with the other acknowledged rules of harmony. This is denominated the simple fugue. When the music begins with two or more different points, and the parts intermix or change alternately, the piece is called a double fugue. And when the succeeding parts are made to fly in opposite directions, some ascending, the others descending, the piece is called a counter fugue.

FUIRE'NA. In botany, a genus of the class triandria, order monogynia. Ament imbricate with awned scales; calyxless; corol three-valved; the valves petal-form, inversely heart-shaped, terminated by an awn. One species; a tall grass of Surinam and Jamaica, with terminal and axillary panicles.

FULA, or THULE, one of the Shetland islands, W. of Mainland. It is thought by some to be the same which the ancients reckoned the ultimate limit of the habitable globe, and to which, therefore, they gave the appellation of ultima Thule. It is doubtful, however, whether this be really the island so called; because, had the ancients reached it, they must have seen land still further to the N. E.; Mainland, Yell, and Unst, being all further N.

FU'LCIMENT. *s.* (*fulcimentum*, Latin.) That on which a body rests, which acts or is acted upon at each end (*Wilkins*).

FU'LCRE. In botany: (*fultum*, from *fulcio.*) Prop, or support. A help to vegetables for their commodious sustentation.—Fulcra adminicula plantæ sunt, pro commodiore sustentatione.

Fulcres are of seven kinds.—1. Stipula or stipule. 2. Bractea or bracte. 3. Spina or thorn. 4. Aculeus or prickle. 5. Cirrus, clasper or tendril. 6. Glandula, or gland. 7. Pilus, hairs or pubescence, or as Linnéus has arranged them, in Delin. Pl.

1. Petiolus, the petiole, leaf-stalk or foot-stalk. 2. Stipula. 3. Cirrus. 4. Pubes. 5. Arma, arms or instruments of defence; comprehending prickles, thorns and stings. 6. Bractea. 7. Pedunculus, the peduncle, flower-stalk and fruit-stalk. These terms are explained in their several places.

FULCRUM, in mechanics, the prop or support by which a lever is sustained.

FULDE, a considerable town of Germany, in the circle of the Upper Rhine, and in the Buchaw, with a celebrated abbey. Lat. 50. 40 N. Lon. 9. 43 E.

To FULFI'L. *v. a.* (*full* and *fill.*) 1. To fill till there is no room for more (*Shak.*). 2. To answer any prophecy or promise by performance (*Acts*). 3. To answer any purpose or design (*Milton*). 4. To answer any desire by compliance or gratification (*Dryden*). 5. To answer any law by obedience (*Milton*).

FULFRA'UGHT. *a.* (*full* and *fraught.*) Fully stored (*Shakspeare*).

FU'LGENCY. *s.* (*fulgens*, Lat.) Splendour; lustre; glitter.

FU'LGENT. *a.* (*fulgens*, Lat.) Shining; dazzling; exquisitely bright (*Milton*).

FU'LGID. *a.* (*fulgidus*, Latin.) Shining; glittering; dazzling.

FULGI'DITY. *s.* (from *fulgid.*) Splendour.

FULGORA, lanthorn-fly. In zoology, a genus of the class insecta, order hemiptera. Head hollow, inflated, extended forwards; antennas short, seated beneath the eyes; consisting of two joints, the outer one larger and

globular; snout elongated, inflated, four-jointed; legs ambulatory. Twenty-five species—chiefly of India and South America; a few of Africa and Europe, and one of our own country. The following are the most curious.

1. F. lanternaria. Front extended straight; wing-cases variegated; wings with each a large ocellated spot. This is a very elegant as well as a very extraordinary insect. Its length, from the tip of the front to that of the tail, is nearly three inches and a half; and from wing's end to wing's end, when expanded, nearly five inches and a half. The head is nearly as long as the whole of the rest of the animal; and is the immediate seat of that light for which this insect is so remarkable. The ground colour is an elegant yellow, with a strong tinge of green in some parts, and marked with numerous bright red-brown variegations in the form of stripes and spots: while in the beautiful ocellated spot in the lower pair of wings the iris or external circle is scarlet, and the pupil half scarlet and half semi-transparent white.

It inhabits Surinam and other parts of South America; and emits a beautiful and strong phosphoric light from the hollow part of the head. Madame Merian, in her work on the Insects of Surinam, asserts that the light of one of them alone is sufficient to read a common newspaper by: although she does not pretend, as Dr. Darwin has ascribed to her, in the way of poetic licence, in a note subjoined to his poem on the Loves of the Plants, to have drawn and finished her figure of this extraordinary insect by its own light. See Nat. Hist. Pl. CXIX.

2. F. candelaria. Front extended, ascending; wing-cases green spotted with yellow; wings yellow tipt with black; head and front red; measures nearly two inches in length from the top of the front to the extremity of the tail; and two and a half inches in breadth, with the wings expanded. It is, like the last, a very elegant insect, and like that yields a considerable portion, though, as being smaller, not an equal portion, of intrinsic light. It is a native of China.

3. F. diadema. Front expanded; muricate, trifid at the tip: wings black edged with red. Inhabits India; and in size and phosphoric powers a rival of the last.

4. F. Europæa. Front conic; body green; wings hyaline, reticulate: inhabits Europe; and the only species of the genus that has been found in England. It was the earliest discovered in Europe, and hence its specific name; but this name is now improper, as many others have since been discovered to possess an European origin.

Several of these species are luminous, and especially F. lanternaria, F. candelaria, and F. diadema. The phosphoric splendour, contrary to the physiology of the lampyris, proceeds from its head; and is so strong, that travellers are said to be directed on their journey by fixing one or two of them to the end of a stick. "The Indians," says Mad. Merian, "once brought me, before I knew that they shone by night, a number of these lanthorn-flies, which I shut up in a large wooden box. In the night they made such a noise that I woke in a fright and ordered a light to be brought, not knowing whence the noise proceeded. As soon as we found that it came from the box, we opened it: but were still much more alarmed, and let it fall to the ground at seeing a flame of fire come out of it; and as many animals as came out, so many flames of fire appeared. When we found this to be the case, we recovered from our fright, and again collected the insects, highly admiring their splendid appearance." See LUMINOUS ANIMALS.

FU'LGOUR. *s.* (*fulgur*, Latin.) Splendour; dazzling brightness (*Moore*).

FULGURA'TION. *s.* (*fulguratio*, Latin.) The act of lightning.

FU'LHAM. *s.* A cant word for false dice. (*Shakspeare*).

FULHAM, a village in Middlesex, four miles W. by S. of London. It is seated on the Thames, and has been the demesne of the bishop of London ever since the conquest.

FU'LICA. In zoology, a genus of the class aves, order grallæ. Bill convex, upper mandible arched over the lower at the edge; lower gibbous near the tip; nostrils oblong, front bald; feet four-toed, subpinnate. These frequent waters, and feed on worms, insects, and small fishes; have a body compressed; bill thick and bent in towards the tip, the upper mandible reaching far up the forehead; wings and tail short. The gallinules have the feet cleft, the upper membranaceous at the base, and the wings concave. The coots have the toes surrounded by a scolloped membrane, the mandibles equal, nostrils oval, narrow and short. Twenty-five species, subdivided as below.

A. Feet cleft: gallinule

B. Feet pinnate: coot.

We shall offer a specimen or two of each.

1. F. chloropus. Moor-hen. Common gallinule. Front tawny; bracelets red; body blackish, or sooty mixed with olive; beneath cinereous, irids red. Inhabits Europe and America: fourteen inches long; flies with difficulty, but runs and swims well; builds near the water side on low trees or shrubs; strikes with its bill like a hen; lays seven dirty-white eggs twice or thrice a year, thinly spotted with rusty; flesh delicious.

2. F. purpurea. Crowing gallinule. Purple; bill pale; eyes greenish yellow. Inhabits the marshes of New Spain, and crows like a cock.

3. F. porphyrio. Purple gallinule. Front red; bracelets many; body green, beneath violet; head and neck above, glossy violet; cheeks and throat violet-blue; back and rump glossy green; wings and rounded tail shining green, within brown. Inhabits most temperate and warm places; fifteen inches long; is docile and easily tamed; stands on one leg, and lifts the

food to its mouth with the other; feeds on fishes, roots, fruits and seeds. Flesh said to be good.

4. F. atra. Common coot. Five varieteis.

α Front flesh-colour; bracelets greenish-yellow; body blackish.

β Black: wings white.

γ Entirely black; breast and belly waved with ferruginous.

δ Brown: chin, belly and primary quill-feathers white; head spotted with white; upper mandible red.

ε White: head and wings with a few spots. Inhabits Europe, Asia, and America; fifteen inches long; frequents lakes and still rivers; and forms a floating nest among the rushes; lays numerous dirty-white eggs, sprinkled with minute, deep-rusty spots; the young, when first hatched, are very deformed; runs along the water, swims and dives dextrously; feeds on small insects, aquatic fishes, and seeds: in winter time often repairs to the sea.

5. F. aterrima. Greater coot. Front white; bracelets red; body blackish. Inhabits, like the last, our own country and other parts of Europe: scarcely differs from it but in increased magnitude and depth of black colour.

FULI'GINOUS. *a.* (*fuliginosus*, Lat.) Sooty; smoky (*Howel*).

FU'LIGO. (*fuligo*, quasi *fumiligo*, from *fumus*, smoke.) Soot. Wood soot, fuligo ligni, or the condensed smoke from burning wood, has a pungent, bitter, and nauseous taste, and is resolved by chemical analysis into a volatile alkaline salt, an empyreumatic oil, a fixed alkali, and an insipid earth. The tincture prepared from this substance, tinctura fuliginis, is recommended as a powerful anti-spasmodic in hysterical affections.

FU'LIGO, in botany, a genus of the class cryptogamia, order fungi. Fungus with a cellular fibrous bark; the fibres penetrating in a reticulate manner through the seminal mass. Three species; one, F. septica, yellow and lanciniate, a native of our own country.

FU'LIMART. *s.* A kind of stinking ferret (*Walton*).

FULK (William,) a learned and eminent divine of the church of England, in the 16th century. He was patronised by the earl of Leicester, who in 1571 presented him to the living of Warley in Essex, and soon after to that of Diddington in Suffolk. He attended his patron when he went ambassador to France; and on his return was made master of Pembroke-hall, and Margaret professor of divinity at Cambridge. His works are very numerous, levelled chiefly at the papists. The most considerable of them is his Comment on the Rhemish Testament. He died in 1589.

FULL. *a.* (fulle, Saxon.) 1. Replete; without vacuity; having no space void (*Psalms*). 2. Abounding in any quality good or bad (*Sidney. Tillotson*). 3. Stored with any thing; well supplied with any thing (*Tickel*). 4. Plump; saginated; fat (*Wiseman*). 5. Saturated; sated (*Bacon*). 6. Crowded with regard to the imagination or memory (*Locke.*) 7. Large; great in effect (*Arbuthnot*). 8. Complete; such as that nothing further is desired or wanted (*Hammond*). 9. Complete without abatement (*Swift*). 10. Containing the whole matter; expressing much (*Denham*). 11. Strong; not faint; not attenuated (*Pope*). 12. Mature; perfect (*Bacon*). 13. Spread to view in all dimensions (*Addison*).

FULL FLOWER. (*flos plenus.*) In botany. When the corol is so multiplied as to exclude all the stamens. Polypetalous flowers are generally the object of plenitude. See LUXURIANS.

FULL MOON (*plenilunium*), that phasis of the moon, when the whole disk is illuminated; which is in the time of her opposition to the sun.

FULL. *s.* (from the adjective.) 1. Complete measure; freedom from deficiency (*Clarendon*). 2. The highest state or degree (*Shakspeare*). 3. The whole; the total (*Shakspeare*). 4. The state of being satiated (*Jeremiah*). 5. (Applied to the moon.) The time in which the moon makes a perfect orb (*Bacon*).

FULL. *ad.* 1. Without abatement (*Milton*). 2. With the whole effect (*Dryden*). 3. Exactly (*Addison*). 4. Directly (*Dryden*).

FULL-BLOWN. *a.* (*full* and *blown.*) 1. Spread to the utmost extent, as a perfect blossom (*Denham*). 2. Stretched by the wind to the utmost extent (*Dryden*).

FULL-BO'TTOMED. *a.* (*full* and *bottom*) Having a large bottom (*Guardian*).

FULL-EA'RED. *a.* (*full* and *ear*). Having the heads full of grain (*Denham*).

FULL-EY'ED. *a.* (*full* and *eye.*) Having large prominent eyes.

FULL-FE'D. *a.* (*full* and *fed.*) Sated; fat; saginated (*Pope*).

FULL-LA'DEN. *a.* (*full* and *laden.*) Laden till there can be no more added (*Tillotson*).

FULL-SPREAD. *a.* (*full* and *spread.*) Spread to the utmost extent (*Dryden*)

FULL-SU'MMED. *a.* (*full* and *summed*) Complete in all its parts (*Howel*).

To FULL. *v. a.* (*fullo*, Lat.) To cleanse cloth from its oil or grease.

FU'LLAGE. *s.* (from *full.*) The money paid for fulling or cleansing cloth.

FULLAN, a country in the interior part of Africa, W. of the kingdom of Cushna Its boundaries have not been ascertained.

FULLER. *s.* (*fullo*, Latin.) One whose trade is to cleanse and scour cloths.

FULLER (Nicholas), prebendary of Salisbury, and a learned English critic; who published in 1617 Miscellanea Theologica, in four books, and afterward two more of Miscellanea Sacra. He died in 1623; and there are some MSS. of his remaining in the Bodleian library, that show his great skill in Hebrew and philology.

FULLER (Dr. Thomas), a learned English divine, was born at Aldwinckle, near Oundle, in Northamptonshire, about the year 1608, and studied at Cambridge. He was chosen minister of St. Bennet's there; and, at about 23 years of age, his merit was so great, that he

was in consequence of it presented to a prebend in the church of Salisbury. He had also the living of Broad Windsor in Dorsetshire, and about 1640 became lecturer at the Savoy. It is said his memory was so tenacious and comprehensive, that he could make use of a sermon verbatim if he once heard it. He once undertook, in passing to and from Temple-bar to the Poultry, to tell at his return every sign as it stood in order on both sides of the way, repeating them either backwards or forwards; and this task he actually performed. He wrote, 1. A History of the Holy War. 2. The Church-history of Britain, in folio. 3. Andronicus, or the Unfortunate Politician, in 8vo. 4. A Pisgah-sight of Palestine. 5. A History of English Worthies; and other works. He died in August 1661, and was interred in the chancel of Cranford church in Middlesex, whither his body was attended by at least 200 of his brethren of the ministry. He was a learned, industrious, pious, moderate, and lively writer. His style however is exceedingly quaint, and he was too fond of punning. The doctor was a very corpulent man, and once as he was riding with a gentleman of the name of Sparrowhawk, he could not help cracking a joke upon his companion. "What is the difference (said he) between an *owl* and a *sparrowhawk*?" "It is (answered the other) *fuller* in the head, *fuller* in the body, and *fuller* all over."

FULLER'S EARTH. See ARGILLA FULLONICA.

The greatest quantity and the finest quality of this earth is dug in the pits at Wavedon, near Woburn, Bedfordshire.

FULLER'S WEED. See DIPSACUS.

FULLERY, the place where cloths, &c. undergo the operation of fulling.

FULLING, the art or act of cleansing, scouring, and pressing cloths, stuffs, and stockings, to render them stronger, closer, and firmer: called also milling. Pliny (lib. vii. cap. 56.) asserts, that one Nicias, the son of Hermias, was the first inventor of the art of fulling: and it appears by an inscription, quoted by Sir G. Wheeler in his Travels through Greece, that this same Nicias was a governor in Greece in the time of the Romans. The fulling of cloths and other stuffs is performed by a kind of water-mill, thence called a fulling or scouring mill. These mills, except in what relates to the mill-stones and hopper, are much the same with corn-mills: and there are even some which serve indifferently for either use; corn being ground, and cloths fulled, by the motion of the same wheel. Whence in some places, particularly in France, the fullers are called millers; grinding corn and milling stuffs at the same time.

The principal parts of the fulling-mill are: the wheel, with its trundle, which gives motion to the tree or spindle, whose teeth communicate it to the pestles or stampers, which are hereby raised and made to fall alternately, according as its teeth catch on or quit a kind of latch in the middle of each pestle. The pestles and troughs are of wood; each trough having at least two, sometimes three pestles, at the discretion of the master, or according to the force of the stream of water. In these troughs are laid the cloths, stuffs, &c. intended to be fulled: then, letting the current of water fall on the wheel, the pestles are successively let fall thereon, and by their weight and velocity stamp and press the stuffs very strongly, which by this means become thickened and condensed. In the course of the operation, they sometimes make use of urine, sometimes of fuller's earth, and sometimes of soap. To prepare the stuffs to receive the first impressions of the pestle, they are usually laid in urine; then in fuller's earth and water; and, lastly, in soap dissolved in hot water. Soap alone would do very well; but this is expensive: though fuller's earth, in the way of our dressing, is scarce inferior thereto; but then it must be well cleared of all stones and grittinesses, which are apt to make holes in the stuff. As to urine, many say it is prejudicial, and ought to be entirely discarded; not so much on account of its ill smell, as of its sharpness and saltness, which qualities are apt to render the stuffs dry and harsh. The true method of fulling with soap is delivered by Mons. Colinet, in an authentic memoir on that subject, supported by experiments made by order of the marquis de Louvois, then superintendant of the arts and manufactories of France; the substance of which we shall here subjoin.

The method of fulling cloths and woollen stuffs with soap is this:—A coloured cloth, of about 45 ells, is to be laid in the usual manner in the trough of a fulling-mill; without first soaking it in water, as is commonly practised in many places. To full this trough of cloth, 15 pounds of soap are required; one half of which is to be melted in two pails of river or spring water, made as hot as the hand can well bear it. This solution is to be poured by little and little upon the cloth, in proportion as it is laid in the trough: and thus it is to be fulled for at least two hours; after which, it is to be taken out and stretched. This done, the cloth is immediately returned into the same trough, without any new soap, and there fulled two hours more. Then taking it out, they wring it well, to express all the grease and filth. After the second fulling, the remainder of the soap is dissolved as in the former, and cast four different times on the cloth; remembering to take out the cloth every two hours, to stretch it, and undo the plaits and wrinkles it has acquired in the trough. When they perceive it sufficiently fulled, and brought to the quality and thickness required, they scour it for good in hot water, keeping it in the trough till it be quite clean. As to white cloths, since they full more easily and in less time than coloured ones, a third part of the soap may be spared.

The fulling of stockings, caps, &c. should be performed somewhat differently, viz. either with the feet or the hands, or a kind of wooden rack, either armed with teeth of the same matter, or else horses or bullock's teeth. The

ingredients made use of are, urine, green soap, white soap, and fuller's earth. But the urine also is reckoned prejudicial here. Woven stockings, &c. should be fulled with the soap alone: for those that are knit, earth may be used with the soap. Indeed it is common to full these kinds of works with the mill, after the usual manner of cloth, &c.; but that is too coarse and violent a manner, and apt to damage the work, unless it is very strong.

FU'LLINGMILL. *s.* (*full* and *mill.*) A mill where the water raises hammers which beat the cloth till it be cleansed (*Mortimer*).

FU'LLY. *ad.* (from *full.*) 1. Without vacuity. 2. Completely; without lack (*Hook.*).

FULMAR, in ornithology. See PROCELLARIA.

FULMAR, in zoology. See MUSTELA.

FU'LMINANT. *a.* (*fulminans*, Latin.) Thundering; making a noise like thunder.

To FU'LMINATE. *v. n.* (*fulmino*, Lat.) 1. To thunder (*Randolph*). 2. To make a loud noise or crack (*Boyle*). 3. To issue out ecclesiastical censures.

To FU'LMINATE. *v. a.* To throw out as an object of terrour (*Ayliffe*).

FULMINATION. In chemistry, explosion or detonation, accompanied with a very considerable degree of sound. All these equally imply rapid decomposition with or without flame, and the intensity of sound alone distinguishes the idea of *fulmination* from those of *detonation* and *explosion*.

FULMINATING POWDER; a powder that explodes upon the application of certain degrees of heat with instantaneous combustion, and prodigious sound. These are sometimes made with metals, and somtimes without.

Simple fulminating powder without any metallic substance is thus prepared: Take three parts of nitre, two of purified pearl-ash, and one of flowers of sulphur, mix the whole very accurately in an earthen mortar, and place it on a tile or plate before the fire till it is perfectly dry: then transfer it while hot into a ground stopper bottle, and it may be kept without injury for any length of time. In order to experience its effects, pour from ten to forty grains into an iron ladle, and place it over a slow fire: in a short time the powder becomes brown and acquires a pasty consistence; a blue lambent flame then appears on the surface, and in an instant after the whole explodes with a stunning noise and a slight momentary flash. If the mass be removed from the fire as soon as it is fused, and kept in a dry well-closed vial, it may at any time be exploded by a spark, in which case it burns like gunpowder, but more rapidly and with greater detonation; but this effect cannot be produced on the unmelted powder how accurately soever the ingredients of it are mixed together. When fulminating powder is in fusion, but not heated to the degree necessary to produce the blue flame, a particle of ignited charcoal thrown upon it will occasion immediately a remarkably loud explosion.

It appears that the ingredients of this powder do not acquire their fulminating property till combined by fusion; in other words, till the potash of sulphur form sulphuret of potash: whence fulminating powder may also be made by mixing sulphuret of potash with nitre, instead of by adding the sulphur and alkali separate.

In all these the cause of the detonation, or fulmination, is not accurately understood. In simple fulminating powder, there is a very large portion of elastic gass evolved; in fulminating gold or silver a much smaller; yet the explosion in the latter case is infinitely greater than that in the former.

Fulminating gold.—Dissolve pure gold in nitro-muriatic acid to saturation, and dilute the solution with three times its bulk of distilled water, and add to it gradually some pure ammonia, a yellow precipitate will be obtained, which must be repeatedly washed with distilled water, and dried on a chalk-stone or in a filter. When perfectly dry, it is called fulminating gold, and detonates by heat, as may be shewn by heating a few grains of it on the point of a knife over the candle.

Fulminating silver.—Dissolve fine silver in pale nitric acid, and precipitate the solution by lime water; decant the fluid, mix the precipitate with liquid ammonia, and stir it till it assumes a black colour; then decant the fluid, and leave it in the open air to dry. This product is fulminating silver, which when once obtained cannot be touched without producing a violent explosion. It is the most dangerous preparation known, for the contact of fire is not necessary to cause it to detonate. It explodes by the mere touch. Its preparation is so hazardous, that it ought not to be attempted without a mask, with strong glass eyes, upon the face. No more than a single grain ought at any time to be tried as an experiment. This was invented by M. Berthollet. See ARGENTUM NATIVUM.

M. Chenevix has invented a fulminating silver not so dangerous as that just mentioned. It explodes only by a slight friction in contact with combustible bodies. It is thus prepared: diffuse a quantity of alumina through water, and let a current of oxygenated muriatic acid gass pass through it for some time. Then digest some phosphate of silver on the solution of the oxygenated muriate of alumina, and evaporate it slowly. The product obtained will be a hyper-oxygenated muriate of silver, a single grain of which, in contact with two or three of sulphur, will explode violently with the slightest friction.

Fulminating mercury.—The mercurial preparations which fulminate, when mixed with sulphur, and gradually exposed to a gentle heat, are well known to chemists: they were discovered, and have been fully described, by Mr. Bayen.

"MM. Brugnatelli and Van Mons have likewise produced fulminations by concussion, as well by nitrat of mercury and phosphorus as with phosphorus and most other nitrats. Cinnabar likewise is amongst the substances which, according to MM. Fourcroy and Vauquelin, detonate by concussion with oxymuriat of potash.

"M. Ameilon had, according to M. Berthollet, observed, that the precipitate obtained from nitrat of mercury, by oxalic acid, fuses with a hissing noise.

"But mercury, and most if not all its oxyds, may, by treatment with nitric acid and alcohol, be converted into a whitish crystallized powder, possessing all the inflammable properties of gunpowder, as well as many peculiar to itself.

"I was led to this discovery (says Mr. Howard, the inventor) by a late assertion, that hydrogen

is the basis of the muriatic acid: it induced me to attempt to combine different substances with hydrogen and oxygen. With this view I mixed such substances with alcohol and nitric acid as might (by predisposing affinity) favour as well as attract an acid combination of the hydrogen of the one, and the oxygen of the other. The pure red oxyd of mercury appeared not unfit for this purpose; it was therefore intermixed with alcohol, and upon both nitric acid was affused. The acid did not act upon the alcohol so immediately as when these fluids are alone mixed together, but first gradually dissolved the oxide: however, after some minutes had elapsed, a smell of ether was perceptible, and a white dense smoke, much resembling that from the liquor fumans of Libavius, was emitted with ebullition. The mixture then threw down a dark-coloured precipitate, which by degrees became nearly white. This precipitate I separated by filtration; and observing it to be crystallized in smaller acicular crystals, of a saline taste, and also finding a part of the mercury volatilized in the white fumes, I must acknowledge I was not altogether without hopes that muriatic acid had been formed, and united to the mercurial oxide; I therefore, for obvious reasons, poured sulphuric acid upon the dried crystalline mass, when a violent effervescence ensued, and, to my great astonishment, an explosion took place. The singularity of this explosion induced me to repeat the process several times; and finding that I always obtained the same kind of powder, I prepared a quantity of it, and was led to make the series of experiments which I shall have the honour to relate in this paper.

"I first attempted to make the mercurial powder fulminate by concussion; and for that purpose laid about a grain of it upon a cold anvil, and struck it with a hammer, likewise cold. It detonated slightly, not being, as I suppose, struck with a flat blow; for upon using three or four grains, a very stunning disagreeable noise was produced, and the faces both of the hammer and the anvil were much indented.

"Half a grain, or a grain, if quite dry, is as much as ought to be used on such an occasion.

"The shock of an electrical battery, sent through five or six grains of the powder, produces a very similar effect. It seems, indeed, that a strong electrical shock generally acts on fulminating substances like the blow of a hammer. Messrs. Fourcroy and Vauquelin found this to be the case with all their mixtures of oxymuriate of potass.

"To ascertain at what temperature the mercurial powder explodes, two or three grains of it were floated on oil, in a capsule of leaf tin; the bulb of a Fahrenheit's thermometer was made just to touch the surface of the oil, which was then gradually heated till the power exploded, as the mercury of the thermometer reached the 368th degree.

"Desirous of comparing the strength of the mercurial compound with that of gunpowder, I made the following experiment in the presence of my friend Mr. Abernethy.

"Finding that the powder could be fired by flint and steel, without a disagreeable noise, a common gunpowder proof, capable of containing eleven grains of fine gunpowder, was filled with it, and fired in the usual way: the report was sharp, but not loud. The person who held the instrument in his hand felt no recoil; but the explosion *laid open the upper part of the barrel, nearly from the touch-hole to the muzzle, and struck off* the hand of the register, the surface of which was evenly indented, to the depth of 0.1 of an inch, as if it had received the impression of a punch.

"The instrument used in this experiment being familiarly known, it is therefore scarcely necessary to describe it: suffice it to say, that it was of brass, mounted with a spring register, the moveable hand of which closed up the muzzle, to receive and graduate the violence of the explosion. The barrel was half an inch in caliber, and nearly half an inch thick, except where a spring of the lock impaired half its thickness.

"A gun belonging to Mr. Keir, an ingenious artist of Camden-Town, was next charged with seventeen grains of the mercurial powder, and a leaden bullet. A block of wood was placed at about eight yards from the muzzle to receive the ball, and the gun was fired by a fuse. No recoil seemed to have taken place, as the barrel was not moved from its position, although it was in no ways confined. The report was feeble: the bullet, Mr. Keir conceived, from the impression made upon the wood, had been projected with about half the force it would have been by an ordinary charge, or sixty-eight grains, of the best gunpowder. We therefore re-charged the gun with thirty-four grains of the mercurial powder; and as the great strength of the piece removed any apprehension of danger, Mr. Keir fired it from his shoulder, aiming at the same block of wood. The report was like the first, sharp, but not louder than might have been expected from a charge of gunpowder. Fortunately Mr. Keir was not hurt; but the gun was burst in an extraordinary manner. The breech was what is called a patent one, of the best forged iron, consisting of a chamber 0.4 of an inch thick all round, and 0.4 of an inch in caliber; it was torn open and flawed in many directions, and the gold touch-hole driven out. The barrel into which the breech was screwed was 0.5 of an inch thick; it was split by a single crack three inches long, but this did not appear to me to be the immediate effect of the explosion. I think the screw of the breech, being suddenly enlarged, acted as a wedge upon the barrel. The ball missed the block of wood, and struck against a wall, which had already been the receptacle of so many bullets, that we could not satisfy ourselves about the impression made by this last.

"As it was pretty plain that no gun could confine a quantity of the mercurial powder sufficient to project a bullet with a greater force than an ordinary charge of gunpowder, I determined to try its comparative strength in another way. I procured two blocks of wood, very nearly of the same size and strength, and bored them with the same instrument to the same depth. The one was charged with half an ounce of the best Dartford gunpowder, and the other with half an ounce of the mercurial powder; both were alike buried in sand, and fired by a train communicating with the powders by a small touch-hole. The block containing the gunpowder was simply split into three pieces: that charged with the mercurial powder was burst in every direction, and the parts immediately contiguous to the powder were absolutely pounded, yet the whole hung together, whereas the block split by the gunpowder had its parts fairly separated. The sand surrounding the gunpowder was undoubtedly most disturbed: in short, the mercurial powder appeared to have

acted with the greatest energy, but only within certain limits.

"The effects of the mercurial powder, in the last experiments, made me believe that it might be confined, during its explosion, in the centre of a hollow glass globe. Having therefore provided such a vessel, seven inches in diameter, and nearly half an inch thick, mounted with brass caps, and a stopcock, I placed ten grains of mercurial powder on thin paper, laid on iron wire, 149th of an inch thick, across the paper, through the midst of the powder, and, closing the paper, tied it fast at both extremities with silk to the wire. As the inclosed powder was now attached to the middle of the wire, each end of which was connected with the brass caps, the packet of powder became, by this disposition, fixed in the centre of the globe. Such a charge of an electrical battery was then sent along the wire, as a preliminary experiment (with Mr. Cuthbertson's electrometer) had shewn me would, by making the wire red hot, inflame the powder. The glass globe withstood the explosion, and of course retained whatever gasses were generated; its interior was thinly coated with quicksilver, in a very divided state. A bent glass tube was now screwed to the stop-cock of the brass cap, which being introduced under a glass jar standing in the mercurial bath, the stop-cock was opened. Three cubical inches of air rushed out, and a fourth was set at liberty when the apparatus was removed to the water tub. The explosion being repeated, and the air all received over water, the quantity did not vary. To avoid an error from change of temperature, the glass globe was, both before and after the explosion, immersed in water of the same temperature. It appears, therefore, that the ten grains of powder produced four cubical inches only of air.

"To continue the comparison between the mercurial powder and gunpowder, ten grains of the best Dartford gunpowder were in a similar manner set fire to in the glass globe: it remained entire. The whole of the powder did not explode, for some complete grains were to be observed adhering to the interior surface of the glass. Little need be said of the nature of the gasses generated during the combustion of the gunpowder: they must have been carbonic acid gass, sulphureous acid gass, nitrogen gass, and (according to Lavoisier) perhaps hydrogen gass. As to the quantity of these, it is obvious that it could not be ascertained: because the two first were, at least in part, speedily absorbed by the alkali of the nitre, left pure after the decomposition of its nitric acid."

The following description will give the experimental philosopher a clear idea of the instrument used in this business.

The ball or globe of glass is nearly half an inch thick, and seven inches in diameter. It has two necks, on which are cemented two brass caps, each being perforated with a female screw, to receive the male ones; through the former a small hole is drilled; the latter is furnished with a perforated stud or shank. By means of a leather collar the neck can be air-tightly closed. When a portion of the powder is to be exploded, it must be placed on a piece of paper, and a small wire laid across the paper, through the midst of the powder: the paper being then closed, is to be tied at each end to the wire with a silken thread. One end of this wire is to be fastened to the end of the shank, and the screw inserted to half its length into the brass cap; the other end of the wire, by means of a needle, is to be drawn through the hole. The screw being now fixed in its place, and the wire drawn tight, is to be secured by pushing the irregular wooden plug into the aperture of the screw, taking care to leave a passage for the air. The stop-cock is now to be screwed on. The glass tube is bent, that it may more conveniently be introduced under the receiver of a pneumatic apparatus.

"From some of the experiments in which the gunpowder proof and the gun were burst, it might be inferred, that the astonishing force of the mercurial powder is to be attributed to the rapidity of its combustion; and a train of several inches in length being consumed in a single flash, it is evident that its combustion must be rapid. But from other experiments it is plain that this force is restrained to a narrow limit, both because the block of wood charged with the mercurial powder was more shattered than that charged with the gunpowder, whilst the sand surrounding it was least disturbed, and likewise because the glass globe withstood the explosion of ten grains of the powder fixed in its centre; a charge I have twice found sufficient to destroy old pistol barrels, which were not injured by being fired when full of the best gunpowder. It also appears from the last experiment, that 10 grains of the powder produced by ignition four cubical inches only of air; and it is not to be supposed that the generation, however rapid, of four cubical inches of air, will alone account for the described force; neither can it be accounted for by the formation of a little water, which, as will hereafter be shewn, happens at the same moment; the quantity formed from ten grains must be so trifling, that I cannot ascribe much force to the expansion of its vapour. The sudden vaporition of a part of the mercury seems to me a principal cause of this immense yet limited force; because its limitation may then be explained, as it is well known that mercury easily parts with caloric, and requires a temperature of 600 degrees of Fahrenheit, to be maintained in the vaporous state. That the mercury is really converted into vapour, by ignition of the powder, may be inferred from the thin coat of divided quicksilver, which, after the explosion in the glass globe, covered its interior surface; and likewise from the quicksilver with which a tallow candle, or a piece of gold, may be evenly coated, by being held at a small distance from the inflamed powder. These facts certainly render it more than probable, although they do not demonstrate that the mercury is volatilized; because it is not unlikely that many mercurial particles are mechanically impelled against the surface of the glass, the gold, and the tallow.

"As to the force of the dilated mercury, Mr. Baumé relates a remarkable instance of it, as follows:

Un alchymiste se présenta à Mr. Geoffroy, et l'assura qu'il avoit trouvé le moyen de fixer le mercure par une opération fort simple. Il fit construire six boîtes rondes en fer fort épais, qui entroient les unes dans les autres: la dernière étoit assujettie par deux cercles de fer qui se croisoient en angles droits. On avoit mis quelques livres de mercure dans la capacité de la première: on mit cet appareil dans un fourneau assez rempli de charbon pour faire rougir à blanc les boîtes de fer: mais, lorsque la chaleur eut pénétré suffisamment le mercure, les boîtes crevèrent, avec une telle explosion qu'il se fit un bruit épouvan-

table: des morceaux de boîtes furent lancés avec tant de rapidité qu'il y en eut qui passèrent au travers de deux planchers; d'autres firent sur la muraille des effets semblables a ceux des éclats de bombes.'—Chymie Expérimentale et Raisonnée tom. ii. p. 393.

"Had the alchemist proposed to fix water by the same apparatus, the nest of boxes must, I suppose, have likewise been ruptured; yet it does not follow that the explosion would have been so tremendous: indeed, it is probable that it would not, for if (as Mr. Kirwan remarked to me) substances which have the greatest specific gravity have likewise the greatest attraction of cohesion, the supposition that the vapour of water, would agree with a position of Sir Isaac Newton, that those particles recede from one another with the greatest force, and are most difficultly brought together, which upon contact cohere most strongly.

"Before I attempt to investigate the constituent principles of this powder, it will be proper to describe the process and manipulations which, from frequent trials, seem to be best calculated to produce it. 100 grains, or a greater proportional quantity of quicksilver, (not exceeding 500 grains), are to be dissolved, with heat, in a measured ounce and a half of nitric acid. This solution being poured cold upon two measured ounces of alcohol, previously introduced into any convenient glass vessel, a moderate heat is to be applied until an effervescence is excited. A white fume then begins to undulate on the surface of the liquor; and the powder will be gradually precipitated, upon the cessation of action and re-action. The precipitate is to be immediately collected on a filter, well washed with distilled water, and carefully dried in a heat not much exceeding that of a water bath. The immediate edulcoration of the powder is material, because it is liable to the re-action of nitric acid; and, whilst any of that acid adheres to it, it is very subject to the influence of light. Let it also be cautiously remembered, that the mercurial solution is to be poured upon the alcohol.

"I have recommended quicksilver to be used in preference to an oxyd, because it seems to answer equally, and is less expensive; otherwise, not only the pure red oxyd, but the red nitrous oxide, and turpeth, may be substituted; neither does it seem essential to attend to the precise specific gravity of the acid, or the alcohol. The rectified spirit of wine, and the nitrous acid of commerce, never failed with me, to produce a fulminating mercury. It is indeed true, that the powder prepared without attention is produced in different quantities, varieties in colour, and probably in strength. From analogy, I am disposed to think the whitest is the strongest; for it is well known that the black precipitates of mercury approach the nearest to the metallic state. The variation in quantity is remarkable; the smallest quantity I ever obtained from 100 grains of quicksilver being 120 grains, and the largest 132 grains. Much depends on very minute circumstances. The greatest product seems to be obtained when a vessel is used which condenses and causes most ether to return into the mother liquor; besides which, care is to be had in applying the requisite heat, that a speedy and not a violent action be effected. 100 grains of an oxide are not so productive as 100 grains of quicksilver.

"As to the colour, it seems to incline to black ... the action of the acid ... of the alcohol is most ... and vice versa.

"I need not observe. that the gasses which were generated during the combustion of the powder in the glass globe, were necessarily mixed with atmospheric air; the facility with which the electric fluid passes through a vacuum, made such a mixture unavoidable.

"The cubical inch of gass received over water was not readily absorbed by it; and, as it soon extinguished a taper without becoming red, or or being itself inflamed, barytes water was let up to the three cubical inches received over mercury, when a carbonate of barytes was immediately precipitated.

"The residue of several explosions, after the carbonic acid had been separated, was found, by the test of nitrous gas, to contain nitrogen or azotic gas; which does not proceed from any decomposition of atmospheric air, because the powder may be made to explode under the exhausted receiver of an air pump. It is therefore manifest that the gasses generated during the combustion of the fulminating mercury, consist of carbonic acid and nitrogen gasses.

"The principal re-agents which decompose the mercurial powder are the nitric, the sulphuric, and the muriatic acids. The nitric changes the whole into nitrous gass, carbonic acid gass, acetous acid, and nitrate of mercury. I resolved it into these different principles, by distilling it pneumatically with nitric acid: this acid upon the application of heat soon dissolved the powder, and extricated a quantity of gass, which was found, by well-known tests, to be nitrous gass mixed with carbonic acid gass. The distillation was carried on until gass no longer came over. The liquor of the retort was then mixed with the liquor collected in the receiver, and the whole saturated with potass; which precipitated the mercury in a yellowish brown powder, nearly as it would have done from a solution of nitrate of mercury. This precipitate was separated by a filter, and the filtrated liquor evaporated to a dry salt, which was washed with alcohol. A portion of the salt being refused by this menstruum, it was separated by filtration, and recognized, by all its properties, to be nitrate of potass. The alcoholic liquor was likewise evaporated to a dry salt, which, upon the effusion of a little concentrate sulphuric acid, emitted acetous acid, contaminated with a feeble smell of nitrous acid, owing to the solubility of a ... l portion of the nitre in the alcohol.

"The sulphuric acid acts upon the powder in a remarkable manner, as has already been noticed. A very concentrate acid produced an explosion nearly at the instant of contact, on account, I presume, of the sudden and copious disengagement of caloric from a portion of powder which is decomposed by the acid. An acid somewhat less concentrate likewise extricates a considerable quantity of caloric, with a good deal of gass; but, as it effects a complete decomposition, it causes no explosion. An acid diluted with an equal quantity of water, by the aid of a little heat, separates the gass so much less rapidly, that it may with safety be collected in a pneumatic apparatus. But, whatever be the density of the acid (provided no explosion be produced), there remains in the sulphuric liquor, after the separation of the gass, a white inflammable and uncrystallized powder mixed with some minute globules of quicksilver.

"To estimate the quantity, and observe the nature, of this uninflammable substance, I treated 100 grains of the fulminating mercury with sulphuric acid a little diluted. The gass being sepa-

lated, I decanted off the liquor as it became clear, and freed the insoluble powder from acid by edulcoration with distilled water; after which I dried it, and found it weighed only 84 grains; consequently had lost 16 grains of its original weight. Suspecting, from the operation of the nitric acid in the former experiment, that these 84 grains (with the exception of the quicksilver globules) were oxalate of mercury, I digested them in nitrate of lime, and found my suspicion just. The mercury of the oxalate united to the nitric acid, and the oxalic acid to the lime. A new insoluble compound was formed; it weighed, when washed and dry, 48.5 grains. Carbonate of potass separated the lime, and formed oxalate of potass, capable of precipitating lime-water and muriate of lime; although it had been depurated from excess of alkali, and from carbonate acid, by a previous addition of acetous acid. That the mercury of the oxalate in the 84 grains had united to the nitric acid of the nitrate of lime was proved, by dropping muriatic acid into liquor from which the substance demonstrated to be oxalate of lime had separated; for a copious precipitation of calomel instantly ensued.

"The sulphuric liquor, decanted from the oxalate of mercury, was now added to that with which it was edulcorated, and the whole saturated with carbonate of potass. As effervescence ceased, a cloudiness and precipitation followed; and the precipitate being collected, washed and dried, weighed 3.4 grains: it appeared to be a carbonate of mercury. Upon evaporating a portion of the saturated sulphuric liquor, I found nothing but sulphate of potass: nor had it any metallic taste. There then remains, without allowing for the weight of the carbonic united to the 3.4 grains, a deficit from the 100 grains of mercurial powder of 12.6 grains, which I ascribe to the gass separated by the action of the sulphuric acid. To ascertain the quantity, and examine the nature of the gass so separated, I introduced into a very small tubulated retort 50 grains of the mercurial powder, and poured upon it three drachms, by measure, of sulphuric acid, with the assistance of a gentle heat. I first received it over quicksilver; the surface of which, during the operation, partially covered itself with a little black powder.

"The gass, by different trials, amounted to from 28 to 31 cubical inches: it first appeared to be nothing but carbonic acid, as it precipitated barytes water, and extinguished a taper, without being itself inflamed, or becoming red. But upon letting up to it liquid caustic ammonia, there was a residue of from 5 to 7 inches of a peculiar inflammable gass, which burnt with a greenish-blue flame. When I made use of the water-tub, I obtained from the same materials from 25 to 27 inches only of gass, although the average quantity of the peculiar inflammable gass was likewise from 5 to 7 inches: therefore, the difference of the aggregate product, over the two fluids, must have arisen from the absorption, by the water, of a part of the carbonic acid in its nascent state. The variation of the quantity of the inflammable gass, when powder from the same parcel is used, seems to depend upon the acid being a little more or less dilute.

"With respect to the nature of the peculiar inflammable gass, it is plain to me, from the reasons I shall immediately adduce, that it is no other than the gass (in a pure state) into which the nitrous etherized gass can be resolved, by treatment with dilute sulphuric acid.

"The Dutch chemists have shewn, that the nitrous etherized gass can be resolved into nitrous gass, by exposure to concentrate sulphuric acid, and that, by using a dilute instead of a concentrate acid, a gass is obtained which enlarges the flame of a burning taper, so much like the gasseous oxide of azote, that they mistook it for that substance, until they discovered that it was permanent over water, refused to detonate with hydrogen, and that the fallacious appearance was owing to a mixture of nitrous gass with inflammable gass.

"The inflammable gass separated from the powder, answers to the description of the gass which at first deceived the Dutch chemists: 1st, in being permanent over water; 2dly, refusing to detonate with hydrogen; and, 3dly, having the appearance of the gasseous oxide of azote, when mixed with nitrous gass.

"The gass separable by the same acid, from nitrous etherized gass, and from the mercurial powder, have therefore the same properties. Every chemist would thence conclude, that the nitrous etherized gass is a constituent part of the powder, and the inflammable and nitrous gass, instead of the inflammable and carbonic acid gass, had been the mixed product extricated from it by dilute sulphuric acid.

"It however appears to me, that nitrous gass was really produced by the action of the dilute sulphuric acid; and that, when produced, it united to an excess of oxygen present in the oxalate of mercury.

"To explain how this change might happen, I must premise, that my experiments have shewn me that oxalate of mercury can exist in two, if not in three states. 1st. By the discovery of Mr. Ameilon, the precipitate obtained by oxalic acid, from nitrate of mercury, fuses with a hissing noise. The precipitate is an oxalate of mercury, seemingly with excess of oxygen. Mercury dissolved in sulphuric acid and precipitated by oxalic acid, and also the pure red oxide of mercury digested with oxalic acid, give oxalates in the same state. 2dly. Acetate of mercury, precipitated by oxalic acid, although a true oxalate is formed, has no kind of inflammability. I consider it as an oxalate with less oxygen than those above-mentioned. 3dly. A solution of nitrate of mercury, boiled with dulcified spirit of nitre, gives an oxalate more inflammable than any other; perhaps it contains most oxygen.

"The oxalate of mercury remaining from the powder in the sulphuric liquor is not only always in the same state as that precipitated from acetate of mercury, entirely devoid of inflammability, but contains globules of quicksilver, consequently it must have parted with even more than its excess of oxygen; and if nitrous gass was present, it would of course seize at least a portion of that oxygen. It is true, that globules of quicksilver may seem incompatible with nitrous acid; but the quantity of the one may not correspond with that of the other, or the dilution of the acid may destroy its action.

"As to the presence of the carbonic acid, it must have arisen either from a complete decomposition of a part of the oxalate; or admitting the nitrous etherized gass to be a constituent principle of the powder, from a portion of the oxygen, not taken up by the nitrous gass, being united with the carbon of the etherized gass.

"The muriatic acid, digested with the mercu-

rial powder, dissolves a portion of it, without extricating any notable quantity of gass. The dissolution evaporated to a dry salt tastes like the corrosive sublimate; and the portion which the acid does not take up is left in a state of an inflammable oxalate.

"These effects all tend to establish the existence of the nitrous etherized gas, as a constituent part of the powder; and likewise corroborate the explanation I have ventured to give of the action of the sulphuric acid. Moreover, a measured ounce and a half of nitrous acid, holding 100 grains of mercury in solution and two measured ounces of alcohol, yield 90 cubical inches only of gass: whereas, without the intervention of mercury, they yield 210 inches. Upon the whole, I trust it will be thought reasonable to conclude, that the mercurial powder is composed of the nitrous etherized gass, and of oxalate of mercury with excess of oxyen. 1st. Because the nitric converts the mercurial powder entirely into nitrous gass, carbonic acid gass, acetous acid, and nitrate of mercury. 2dly. Because the dilute sulphuric acid resolves it into an uninflammable oxalate of mercury, and separates from it a gass resembling that into which the same acid resolves the nitrous etherized gass. 3dly. Because an uninflammable oxalate is likewise left, after the muriatic acid has converted a part of it into sublimate. 4thly. Because it cannot be formed by boiling nitrate of mercury in dulcified spirits of nitre; although a very inflammable oxalate is by this means produced. 5thly. Because the difference of the product of gass, from the same measures of alcohol and nitrous acid, with and without mercury in solution, is not trifling; and, 6thly. Because nitrogen gass was generated during its combustion in the glass globe.

"Should my conclusions be thought warranted by the reasons I have adduced, the theory of the combustion of the mercurial powder will be obvious to every chemist. The hydrogen of the oxalic acid, and of the etherized gass, is first united to the oxygen of the oxalate, forming water; the carbon is saturated with oxygen, forming carbonic acid gass; and a part, if not the whole of the nitrogen of the etherized gass, is separated in the state of nitrogen gass; both which last gasses, it may be recollected, were after the explosion present in the glass globe. The mercury is revived, and, I presume, thrown into vapour; as may well be imagined, from the immense quantity of caloric extricated, by adding concentrate sulphuric acid to the mercurial powder.

"I will not venture to state with accuracy in what proportions its constituent principles are combined. The affinities I have brought into play are complicated, and the constitution of the substances I have to deal with not fully known. But to make round numbers, I will resume the statement, that 100 grains of the mercurial powder lost 16 grains of its original weight, by treatment with dilute sulphuric acid: 84 grains of the mercurial oxalate, mixed with a few minute globules of quicksilver, remained undissolved in the acid. The sulphuric liquor was saturated with carbonic of potass, and yielded 3.4 grains of carbonate of mercury. If 1.4 grains should be thought a proper allowance for the weight of carbonic acid in the 3.4 grains, I will make that deduction, and add the remaining two grains to the 84 grains of mercurial oxalate and quicksilver; I shall then have,

Of oxalate and mercury -	86 grains.
And a deficit, to be ascribed to the nitrous etherized gass and excess of oxygen, -	14
	100

"It may perhaps be proper to proceed still further, and recur to the 48.5 grains, separated by nitrate of lime from the 84 grains of mercurial oxalate and globules of quicksilver. These 48.5 grains were proved to be oxalate of lime; but they contained a minute inseparable quantity of mercury, almost in the state of quicksilver, formerly part of the 84 grains from which they were separated. Had the 48.5 grains been pure calcareous oxalate, the quantity of pure oxalic acid in them would, according to Bergmann, be 23.28 grains. Hence, by omitting the two grains of mercury, in the 3.4 grains of carbonate, 100 grains of the mercurial powder might have been said to contain of pure oxalic acid 23.28 grains; of mercury 62.72 grains; and of nitrous etherized gass and excess of oxygen 14 grains. But as the 48.5 grains were not pure oxalate, inasmuch as they contained the mercury they received from the 84 grains, from which they were generated by the nitrate of lime, some allowance must be made for the mercury successively intermixed with the 84 grains and the 48.5 grains. In order to make corresponding numbers, and allow for unavoidable errors, I shall estimate the quantity of that mercury to have amounted to two grains, which I must of course deduct from the 33.28 grains of oxalic acid. I shall then have the following statement:

That 100 grains of fulminating mercury ought to contain of pure oxalic acid, - -		21.28 grains.
Of mercury formerly united to the oxalic acid, -	60.72	
Of mercury dissolved in the sulphuric liquor, -	2	
And of mercury left in the sulphuric liquor, after the separation of the gasses, - -	2	
Total of mercury,		64.72
Of nitrous etherized gass, and excess of oxygen,		

"Since 100 grains of the powder seem to contain 64.72 grains of mercury, it will be immediately enquired, what becomes of 100 grains of quicksilver, when treated as directed, in the description of the process for preparing the fulminating mercury.

"It has been stated that 100 grains of quicksilver produce, under different circumstances, from 120 to 132 grains of mercurial powder; and, if 100 grains of this powder contain 64.72 grains, 120 grains, or 132 grains, must, by parity of reasoning, contain 78.06 grains, or 85.47 grains; therefore 13.34 grains, or 20.75 grains, more of the 100 grains are immediately accounted for; because 63.72 grains + 13.34 grains = 78.06, and 64.72 grains + 20.75 grains = 85.47 grains. The remaining deficiency of 21.94 grains, or 14.53 grains, which, with the 78.06 grains, or 85.47 grains, would complete the original 100 of quicksilver, remains partly in the liquor from which the powder is separated, and is partly volatilized in the white dense fumes, which in the beginning of this paper I compared to the liquor fumans of Liba-

vius. The mercury cannot, in either instance, be obtained in a form immediately indicative of its quantity; and a series of experiments, to ascertain the quantities in which many different substances can combine with mercury, is not my present object. After observing that the mercury left in the residuary liquor can be precipitated in a very subtle dark powder, by carbonate of potass, I shall content myself with examining the nature of the white fumes.

"It is clear that these white fumes contain mercury: they may be wholly condensed in a range of Wolfe's apparatus, charged with a solution of muriate of ammonia. When the operation is over, a white powder is seen floating with ether on the saline liquor, which, if the bottles are agitated, is entirely dissolved. After the mixture has been boiled, or for some time exposed to the atmosphere, it yields to caustic ammonia a precipitate, in all respects similar to that which is separated by caustic ammonia from corrosive sublimate.

"I would infer from these facts, that the white dense fumes consist of mercury, or perhaps oxide of mercury, united to the nitrous etherized gass; and that, when the muriate of ammonia containing them is exposed to the atmosphere, or is boiled, the gass separates from the mercury; and the excess of nitrous acid, which always comes over with nitrous ether, decomposes the ammoniacal muriate of sublimate, and forms corrosive mercurial muriate or sublimate. This theory is corroborated by comparing the quantity of gass estimated to be contained in the fulminating mercury with the quantities of gass yielded from alcohol and nitrous acid, with and without mercury in solution; not to mention that more ether, as well as more gass, is produced without the intervention of mercury; and that, according to the Dutch chemists, the product of ether is always in the inverse ratio to the product of nitrous etherized gass. Should a further proof be thought necessary to the existence of the nitrous etherized gass in the fulminating mercury, as well as in the white dense fumes, it may be added, that if a mixture of alcohol and nitrous acid holding mercury in solution be so dilute, and exposed of a temperature so low that neither ether nor nitrous etherized gass are produced, the fulminating mercury, or the white fumes, will never be generated; for, under such circumstances, the mercury is precipitated chiefly in the state of an inflammable oxalate. Further, when we consider the different substances formed by an union of nitrous acid and alcohol, we are so far acquainted with all, except the ether and the nitrous etherized gass, as to create a presumption, that no others are capable of volatilizing mercury, at the very low temperature in which the white fumes exist, since, during some minutes, they are permanent over water of 40° Fahrenheit.

"Hitherto, as much only has been said of the gass which is separated from the mercurial powder by dilute sulphuric acid, as was necessary to identify it with that into which the same acid can resolve the nitrous etherized gass: I have further to speak of its peculiarity.

"The characteristic properties of the inflammable gass seem to me to be the following: 1st. It does not diminish in volume, either with oxygen or nitrous gass. 2dly. It will not explode with oxygen by the electric shock, in a close vessel. 3dly. It burns like hydrocarbonate, but with a blueish-green flame; and, 4thly. It is permanent over water.

"It is of course either not formed, or is convertible into nitrous gas by the concentrate nitric and muriatic acids; because by those acids, no inflammable gass was extricated from the powder.

"Should this inflammable gass prove not to be hydrocarbonate, I shall be disposed to conclude that it has nitrogen for its basis; indeed, I am at this moment inclined to that opinion, because I find that Dr. Priestley, during his experiments on his dephlogistigated nitrous air, once produced a gass which seems to have resembled this inflammable gass, both in the mode of burning and in the colour of the flame.

"After the termination of the common solution of iron in spirit of nitre, he used heat, and got, says he, 'such a kind of air as I had brought nitrous air to be, by exposing it to iron, or liver of sulphur; for, on the first trial, a candle burned in it with a much enlarged flame. At another time, the application of a candle to air produced in this manner was attended with a real, though not a loud explosion; and immediately after this a greenish-coloured flame descended from the top to the bottom of the vessel in which the air was contained. In the next produce of air, from the same process, the flame descended blue, and very rapidly from the top to the bottom of the vessel.'

"These greenish and blue-coloured flames, descending from the top to the bottom of the vessel, are precisely descriptive of the inflammable gass separated from the powder. If it can be produced with certainty by the repetition of Dr. Priestley's experiments, or should it by any means be got pure from the nitrous etherized gass, my curiosity will excite me to make it the object of future research; otherwise, I must confess, I shall feel more disposed to prosecute other chemical subjects: for having reason to think that the density of the acid made a variation in the product of this gass, and having never found that any acid, however dense, produced an immediate explosion, I once poured six drachms of concentrate acid upon 50 grains of the powder. An explosion, nearly at the instant of contact, was effected: I was wounded severely, and most of my apparatus destroyed. A quantity moreover of the gass I had previously prepared was lost by the inadvertency of a person who went into my laboratory, whilst I was confined by the consequences of this discouraging accident. But should any one be desirous of giving the gass a further examination, I again repeat, that as far as I am enabled to judge, it may with safety be prepared by pouring three drachms of sulphuric acid, diluted with the same quantity of water, upon 50 grains of the powder, and then applying the flame of a candle until gass begins to be extricated. The only attempt I have made to decompose it, was by exposing it to copper and ammonia; which during several weeks did not effect the least alteration.

"I will now conclude (says Mr. Howard), by observing, that the fulminating mercury seems to be characterised by the following properties:

"It takes fire at the temperature of 368 Fahrenheit; it explodes by friction, by flint and steel, and by being thrown into concentrate sulphuric acid. It is equally inflammable under the exhausted receiver of an air-pump, as surrounded by atmospheric air; and it detonates loudly, both by the blow of a hammer, and by a strong electrical shock.

"Notwithstanding the compositions of fulminating silver and of fulminating gold differ essentially

from that of fulminating mercury, all three have similar qualities. In tremendous effects, silver undoubtedly stands first, and gold perhaps the last. The effects of the mercurial powder and of gunpowder admit of little comparison. The one exerts, within certain limits, an almost inconceivable force: its agents seem to be gass and caloric, very suddenly set at liberty, and both mercury and water thrown into vapour. The other displays a more extended but inferior power: gass and caloric are, comparatively speaking, liberated by degrees; and water, according to count Rumford, is thrown into vapour.

"Hence it seems that the fulminating mercury, from the limitation of its sphere of action, can seldom, if ever, be applied to mining; and, from the immensity of its initial force, cannot be used in fire-arms, unless in cases where it becomes an object to destroy them; and where it is the practice to spike cannon, it may be of service, because I apprehend it may be used in such a manner as to burst cannon without dispersing any splinters.

"The inflammation of fulminating mercury by concussion offers nothing more novel or remarkable than the inflammation, by concussion, of many other substances. The theory of such inflammations has been long since exposed by the celebrated Mr. Berthollet, and confirmed by Messieurs Fourcroy and Vauquelin: yet, I must confess, I am at a loss to understand why a small quantity of mercurial powder made to detonate by the hammer or the electric shock, should produce a report so much louder than when it is inflamed by a match, or by flint and steel. It might at first be imagined, that the loudness of the report could be accounted for, by supposing the instant of the inflammation, and that of the powder's confinement between the hammer and anvil, to be precisely the same; but, when the electrical shock is sent through or over a few grains of the powder, merely laid on ivory, and a loud report in consequence, I can form no idea of what causes such a report.

"The operation by which the powder is prepared, is perhaps one of the most beautiful and surprising in chemistry; and it is not a little interesting to consider the affinities which are brought into play. The superabundant nitrous acid of the mercurial solution must first act on the alcohol, and generate ether, nitrous etherized gas, and oxalic acid. The mercury unites to the two last in their nascent state, and relinquishes fresh nitrous acid, to act upon unaltered alcohol. The oxalic acid, a predisposing affinity seems exerted in favour of its quantity, is evidently not formed fast enough to retain all the mercury; otherwise, no white fumes during a considerable period of the operation, but fulminating mercury alone will be produced.

"Should any doubt still be entertained of the existence of the affinities which have been called predisposing or conspiring, a proof that such affinities really exist will, I think, be afforded, by comparing the quantity of oxalic acid which can be generated from given measures of nitrous acid and alcohol, with the intervention of mercury, and the intervention of other metals. For instance, when two measured ounces of alcohol are treated with a solution of 100 grains of nickel in a measured ounce and a half of nitrous acid, little or no precipitate is produced; yet, by the addition of oxalic acid to the residuary liquor, a quantity of oxalate of nickel, after some repose, is deposited. Copper affords another illustration; 100 grains of copper dissolved in a measured ounce and a half of nitrous acid, and treated with alcohol, yielded me about 18 grains of oxalate, although cupreous oxalate was plentifully generated by dropping oxalic acid into the residuary liquor. About 21 grains of pure oxalic acid seem to be produced from the same materials, when 100 grains of mercury are interposed. Besides, according to the Dutch paper, more than once referred to, acetous acid is the principal residue after the preparation of nitrous ether. How can we explain the formation of a greater quantity of oxalic acid from the same materials, with the intervention of 100 grains of mercury, than with the intervention of 100 grains of copper, otherwise than by the notion of conspiring affinities, so analagous to what we see in other phænomena of nature?

"I have attempted, without success, to communicate fulminating properties, by means of alcohol, to gold, platina, antimony, tin, copper, iron, lead, zinc, nickel, bismuth, cobalt, arsenic, and manganese; but I have not yet sufficiently varied my experiments to enable me to speak with absolute certainty. Silver, when 20 grains of it were treated with nearly the same proportions of nitrous acid and alcohol as 100 grains of mercury, yielded, at the end of the operation, about three grains of a grey precipitate, which fulminated with extreme violence. Mr. Cruickshank had the goodness to repeat the experiment: he dissolved 40 grains of silver in two ounces of the strongest nitrous acid, diluted with an equal quantity of water, and obtained (by means of two ounces of alcohol) 60 grains of a very white powder, which fulminated like the grey precipitate above described. It probably combines with the same principles as the mercury, and of course differs from Mr. Berthollet's fulminating silver, before alluded to. I observe, that a white precipitate is always produced in the first instance; and that it may be preserved by adding water as soon as it is formed; otherwise, when the mother liquor is abundant, it often becomes grey, and is re-dissolved."

Several trials of the mercurial powder were afterwards made at Woolwich in conjunction with colonel Bloomfield and Mr. Cruickshank, upon heavy guns, carronades, &c. from which Mr. Howard generally infers, that any piece of ordnance might be destroyed, by employing a quantity of the mercurial powder equal in weight to one half of the service-charge of gunpowder; and, from the seventh and last experiment, we may also conclude that it would be possible so to proportion the charge of mercurial powder to the size of different cannons, as to burst them without dispersing any splinters. But the great danger attending the use of fulminating mercury, on account of the facility with which it explodes, will probably prevent its being employed for that purpose.

"In addition to the other singular properties of the fulminating mercury (says Mr. Howard), it may be observed, that two ounces inflamed in the open air seem to produce a report much louder than when the same quantity is exploded in a gun capable of resisting its action. Mr. Cruickshank, who mode some of the powder by my process, remarked that it would not inflame gunpowder. In consequence of which, we spread a mixture of coarse and fine-grained gunpowder upon a parcel of the mercurial powder; and after the inflammation of the latter, we collected most, if not all, of the grains of gunpowder. Can this extraordinary fact be explained by the rapidity of

the combustion of fulminating mercury? or is it to be supposed-(as gunpowder will not explode at the temperature at which mercury is thrown into vapour) that sufficient caloric is not extricated during this combustion? From the late opportunity I have had of conversing with Mr. Cruickshank, I find that he has made many accurate experiments on gunpowder; and he has permitted me to state, that the matter which remains after the explosion of gunpowder consists of potass united with a small proportion of carbonic acid, sulphate of potass, and a very small quantity of sulphuret of potass, and unconsumed charcoal. That 100 grains of good gunpowder yielded about 53 grains of this residuum, of which three are charcoal. That it is extremely deliquescent, and when exposed to the air, soon absorbs moisture sufficient to dissolve a part of the alkali; in consequence of which the charcoal becomes exposed, and the whole assumes a black or very dark colour. Mr. Cruickshank likewise informs me, that after the combustion of good gunpowder under mercury, no water is ever perceptible."

FU'LMINATORY. *a.* (*fulmineus*, Latin.) Thundering; striking horrour.

FU'LNESS. *s.* (from *full.*) 1. The state of being filled so as to have no part vacant (*King Charles*). 2. The state of abounding in any quality good or bad. 3. Completeness; such as leaves nothing to be desired (*South*). 4. Completeness from the coalition of many parts (*Bacon*). 5. Completeness; freedom from deficiency (*Shakspeare*). 6. Repletion; satiety (*Taylor*). 7. Plenty; wealth (*Shakspeare*). 8. Struggling perturbation; swelling in the mind (*Bacon*). 9. Largeness; extent (*Dryden*). 10 Force of sound, such as fills the ear; vigour of sound (*Pope*).

FU'LSOME. *a.* (from fulle, Saxon, foul.) 1. Nauseous; offensive (*Otway*). 2. Of a rank odious smell (*Bacon*). 3. Lustful (*Shakspeare*). 4. Tending to obscenity (*Dryden*).

FU'LSOMELY. *ad.* Nauseously; rankly; obscenely.

FU'LSOMENESS. *s.* (from *fulsome.*) 1. Nauseousness. 2. Rank smell. 3. Obscenity (*Dryden*).

FULVIA, an ambitious woman who married the tribune Clodius, and afterwards Curio, and at last M. Antony. She shewed herself cruel as well as revengeful. When Cicero's head had been cut off by order of Antony, Fulvia ordered it to be brought to her, and with the greatest barbarity bored the orator's tongue with her golden bodkin. Antony divorced her to marry Cleopatra, upon which she attempted to persuade Augustus to take up arms against her husband. When this scheme did not succeed, she retired into the east, where her husband received her with great coldness. This totally broke her heart, and she soon after died, about 40 years before the Christian era.

FU'MADO. *s.* (*fumus*, Latin.) A smoked fish (*Carew*).

FU'MAGE. *s.* (from *fumus*, Lat.) Hearth-money.

FUMARIA. Fumitory. In botany, a genus of the class diadelphia, order hexandria. Calyx two-leaved, corol ringent; filaments two, membranaceous; each with three anthers. Thirty species; chiefly European plants, and five indigenous to the fields, woods, or walls of our own country. Generally speaking, low, shrubby, deciduous evergreens: yet some herbaceous; with small simple leaves, and papilionaceous flowers. The only species that we need particularize is F. officinalis, found in our own fields and over Europe generally, with branched, diffuse stem: siliques globular emarginate, one-seeded: leaves more than decompound, with wedge-lanceolate, cut segments. It has long been employed medicinally, as a cardiac, and alterative; and the leaves still form an article in the Materia Medica of the Edinburgh Pharmacopœia.

To FU'MBLE. *v. n.* (*fommelen*, Dutch.) 1. To attempt any thing awkwardly or ungainly (*Cudworth*). 2. To puzzle; to strain in perplexity (*Dryden*). 3. To play childishly (*Shakspeare*).

To FU'MBLE. *v. a.* To manage awkwardly (*Dryden*).

FU'MBLER. *s.* One who acts awkwardly.

FU'MBLINGLY. *ad.* (from *fumble.*) In an awkward manner.

FUME. *s.* (*fumeé*, French; *fumus*, Lat.) 1. Smoke (*Dryden*). 2. Vapour; any volatile parts flying away (*Shakspeare*). 3. Exhalation from the stomach (*Dryden*). 4. Rage; heat of mind; passion (*South*). 5. Any thing unsubstantial (*Shakspeare*). 6. Idle conceit; vain imagination (*Bacon*).

To FUME. *v. n.* (*fumer*, Fr. *fumo*, Latin.) 1. To smoke (*Milton*). 2. To vapour; to yield exhalations (*Shakspeare*). 3. To pass away in vapours (*Ben Jonson*). 4. To be in a rage (*Dryden*).

To FUME. *v. a.* 1. To smoke; to dry in the smoke (*Carew*). 2. To perfume with odours in the fire (*Dryden*). 3. To disperse in vapours (*Mortimer*).

FUME'TTE. *s.* (French.) The stink of meat (*Swift*).

FU'MID. *a.* (*fumidus*, Latin.) Smoky; vaporous (*Brown*).

FUMI'DITY. *s.* (from *fumid.*) Smokiness; tendency to smoke.

To FU'MIGATE. *v. n.* (*fumiger*, French.) 1. To smoke; to perfume by smoke or vapour (*Dryden*). 2. To medicate or heal by vapours.

FUMIGA'TION. *s.* (*fumigation*, French.) 1. Scents raised by fire (*Arbuthnot*). 2. The application of medicines to the body in fumes.

FUMIGATION, in medicine, a process by means of which the nitrous and other mineral acids, in a state of vapour, is dispersed through the apartments of those who lie sick of infectious fevers. This method of destroying contagion, in crowded places, was first brought into practice by Dr. Carmichael Smyth, who having given some striking proofs of its efficacy received a reward from parliament. When this fumigation is undertaken on board ships, the ports and scuttles are closed, a number of pipkins, containing hot sand, are procured, and into each is plunged a small tea-cup, contain-

ing half an ounce of sulphuric acid. As soon as the acid is properly heated an equal quantity of pulverised nitre is added, and the mixture stirred with a glass rod. The vapour resulting from the decomposition of nitre ascends, and is by the nurses conducted to every part of the apartment, which not only abates the malignity of the fever, but effectually stops the progress of infection. In a late volume of the Annales de Chemie, we have some striking facts of the efficacy of fumigation, according to the method of M. Guyton de Morveau, who makes use of sulphuric acid, sea-salt, and manganese. It has been tried, and completely succeeded in stopping the progress of the rot among sheep: it has destroyed the putrid odours arising from meat in the worst possible state, as well as having been eminently successful in the cure of the most alarming fevers, and preventing the effects of infection. See SEPTON.

FU'MINGLY. *ad.* (from *fume.*) Angrily; in a rage.

FUMITORY, in botany. See FUMARIA.

FU'MOUS. FU'MY. *a.* (*fumeux*, French.) Producing fumes (*Dryden*).

FUN. *s.* Sport; high merriment (*More*).

FUNAMBULUS, among the Romans, was what we call a *rope-dancer*, and the Greeks *schœnobates*. See ROPE-DANCER.

FUNARIA, in botany, a genus of the class cryptogamia, order musci. Capsule obovate; fringe double; outer of sixteen oblique wedge-form-teeth, cohering at their lips; inner, a membrane divided into sixteen flat teeth; veil square. Three species; two common to our own country.

FUNCHAL, the capital of Madeira, situate round a bay on the gentle ascent of the first hills, in form of an amphitheatre. It is defended by several forts and batteries. The streets are narrow and dirty; the houses are built of freestone or brick: there are about 15,000 inhabitants. Lat. 32. 28 N. Lon. 17. 6 E.

FU'NCTION. *s.* (*functio*, Latin.) 1. Discharge; performance (*Swift*). 2. Employment; office (*Whitgift*). 3. Single act of any office (*Hooker*). 4. Trade; occupation (*Shakspeare*). 5. Office of any particular part of the body (*Bentley*). 6. Power; faculty (*Pope*).

FUNCTION. (*functio.*) Action. The power or faculty by which any action of an animated body is performed. The functions of the human body are divided into vital, by which life is immediately supported, as the action of the heart and arteries, respiration and animal heat; animal, which are effected through the operation of the mind, as the external and internal senses, the voluntary action of the muscles, voice, watching, and sleep; natural, by which the body is preserved, as hunger, thirst, mastication, deglutition, digestion, chylification, sanguification, nutrition of the body, and the various secretions and excretions; and, lastly, into sexual functions, such as menstruation, conception, formation of the fetus, and parturition.

FUNCTION, a term used in analytics, for an algebraical expression any how compounded of a certain letter or quantity with other quantities or numbers: and the expression is said to be a function of that letter or quantity. Or, a function is the analytical expression of the result which certain operations produce on a given quantity, or on any number of given quantities. Thus $a - 4x$, or $ax + 3x^2$, or $2x - a\sqrt{a^2 - x^2}$, or x^c, or c^x, or log. x, is each of them a function of the quantity x.

On the subject of functions, their divisions, transformations, explication by infinite series, &c. see Euler's Analys. Infinitorum, c. 1. and Lagrange, Theorie des Fonctions Analytiques.

FUND, in general, signifies any sum of money appropriated for a particular purpose. Thus, that part of the national revenue which is set aside for the payment of the national debt is called the sinking fund. But, when we speak of the funds, we generally mean the large sums which have been lent to government, and constitute the national debt; and for which the lenders, or their assignees, receive interest from revenues allotted for that purpose. The term stock is used in the same sense, and is also applied to the sums which form the capital of the Bank of England, the East India and South-Sea companies, the proprietors of which are entitled to a share of the profits of the respective companies.

The establishment of the funds was introduced in Britain at the Revolution, and has since been gradually enlarged, and carried to an amazing extent. Various methods have been used in their turns, but perpetual annuities have been granted for the greatest part; and, even when the money was originally advanced on other conditions, the lenders have been sometimes induced, by subsequent offers, to accept of perpetual annuities, instead of the former terms. The debt for which perpetual annuities are granted is called the redeemable debt, and the other is called the irredeemable debt. Although the debts thus contracted by government are seldom paid for a long term of years, yet any creditor of the public may obtain money for what is due to him when he pleases, by transferring his property in the funds to another; and regular methods are appointed for transacting these transfers in an easy manner. By means of this, the stocks become a kind of circulating capital: and have the same effect, in some respects, as the circulating money in the nation. When a stockholder transfers his share, he may sometimes be able to obtain a greater price than the original value, and at other times be obliged to accept of a less one. The value of the funds depends on the proportion between the interest they bear, and the benefit which may be obtained by applying the money to other purposes. It is influenced by the plenty or scarcity of money, and by the quantity of the public debt; and it is impaired by any event which threatens the safety, or weakens the credit, of the government.

The business of stock-jobbing is founded on the variation of the prices of stock. Persons possessed of real property may buy or sell stock, according to their notion that the value is likely to rise or fall, in expectation of making profit by the difference of price: and a practice has taken place among persons who often possess no property in the funds, to contract for the sale of stock against a future day, at a price now agreed on. For in-

tance: A agrees to sell B 1000*l.* of bank-stock, to be transferred, in 20 days, for 1200*l.* A has, in fact, no such stock; but if the price of bank-stock, on the day appointed for the transfer, should be only 118 per cent., A may purchase as much as will enable him to fulfil his bargain for 1180*l.* and thus gains 20*l.* by the transaction: on the contrary, if the price of bank-stock be 125 per cent. he will lose 50*l.* The business is generally settled without any actual purchase or transfer of stock, by A paying to B, or receiving from him, the difference between the current price of the stock on the day appointed and the price bargained for.

This practice, which is really nothing else than a wager concerning the price of stock, is contrary to law; yet it is carried on to a great extent. In the language of Exchange alley, where matters of this kind are transacted, the buyer is called a bull, and the seller a bear. As neither party can be compelled by law to make good those bargains, their sense of honour, and the disgrace and loss of future credit which attend a breach of contract, are the principles by which the business is supported. When a person declines to pay his loss, he is called a *lame duck*, and dare never afterwards appear in the alley. This opprobrious appellation, however, is not bestowed on those whose failure is owing to want of ability, provided they make the same surrender of their property voluntarily, which the law would have exacted if the debt had been entitled to its sanction.

The interest or dividend on the stock is paid half-yearly; and the purchaser has the benefit of the interest due on the stock he buys, from the last term to the time of purchase. Therefore the prices of the stocks rise gradually, *cæteris paribus*, from term to term, and fall at the term when the interest is paid. In comparing the prices of the different stocks, it is necessary to advert to the term when the last interest was paid; and, allowance being made for this circumstance, the prices of all the government stocks, which bear interest at the same rate, must be nearly the same, as they all depend on the same security.

When a loan is proposed, such terms must be offered to the lenders as may render the transaction beneficial; and this is now regulated by the prices of the old stocks. If the stocks, which bear interest at 4 per cent. sell at par, or rather above, the government may expect to borrow money at that rate; but, if these stocks are under par, the government must either grant a higher interest, or some other advantage to the lenders, in compensation for the difference. For this purpose, besides the perpetual annuity, another annuity has sometimes been granted for life, or for a term of years. Lotteries have frequently been employed to facilitate the loan, by entitling the subscribers to a certain number of tickets, for which no higher price is charged than the exact value distributed in prizes, though their market-price is generally 2*l.* or 3*l.* higher. Sometimes an abatement of a certain proportion of the capital has been granted, and a lender intitled to hold 100*l.* stock though in reality he advanced no more perhaps than 95*l.*

It belongs to the Chancellor of the Exchequer to propose the terms of the loan in parliament; and he generally makes a previous agreement with some wealthy bankers or merchants, who are willing to advance the money on the terms proposed. The subscribers to the loan deposit a certain part of the sum subscribed, and are bound to pay the rest by instalments or stated proportions, on appointed days, under pain of forfeiting what they have deposited. For this they are entitled, perhaps, not only to hold their share in the capital, but to an annuity for 10 years, and to the right of receiving a certain number of lottery-tickets on advantageous terms. They may sell their capital to one person, their annuity to a second, and their right to the tickets to a third. The value of all these interests together is called omnium; and, in order to obtain a ready subscription, it ought to amount to 102*l.* or upwards on 100*l.* of capital. This difference is called the bonus to the subscribers.

The capital advanced to the public, in the form of transferable stocks, and bearing interest from taxes appropriated for that purpose, is called the funded debt. Besides, there is generally a considerable sum due by government, which is not disposed of in that manner, and therefore is distinguished by the appellation of the unfunded debt. This may arise from any sort of national expence, for which no provision has been made, or for which the provision has proved insufficient. The chief branches are:

1st, *Exchequer Bills.*—These are issued from the exchequer generally by appointment of parliament, and sometimes without such appointment, when exigencies require. They bear interest from the time when issued, and are taken in by the Bank of England, which promotes their circulation.

2d, *Navy-Bills.*—The sums annually granted for the navy have always fallen short of what that service required. To supply that deficiency, the Admiralty issues bills in payment of victuals, stores, and the like, which bear interest six months after the time issued. The debt of the navy thus contracted is discharged, from time to time, by parliament.

The interest on all the public debts was formerly paid at the exchequer: but the Bank being found a much more convenient place for this purpose, nearly the whole is now payable there; the company receiving a certain allowance from government for managing all business relative to the public funds. The different denominations of the funds transferable at the Bank of England, with the days on which the transfers are made, and the times when the interest or dividend becomes due, are at present as follows:

Funds.	Transfer days.	Dividends due.
Consolidated 3 per Cent Annuities	Tues. Wed. Th. and Fr	January 5, and July 5.
Three per Cent. Annuities, 1726	Tues. and Thurs	January 5, and July 5.
Navy 5 per Cent. Annuities	Mon. Wed. and Fr	January 5, and July 5.
Bank Stock	Tues. Th. and Fr	April 5, and Oct. 10.
Five per Cent Annuities, 1797 and 1802	Tues. Th. and Fr	April 5, and Oct. 10.
Four per Cent. Consolidated Annuities	Tues. Th. and Sat	April 5, and Oct. 10.
Reduced 3 per Cent. Annuities	Tues. Wed. Th. and Fr.	April 5, and Oct. 10.
Long Annuities	Mon. Wed. and Sat.	April 5, and Oct. 10.
Imperial 3 per Cent Annuities	Mon. Wed. and Fr.	May 1, and Nov. 1.
Imperial Annuities 25 years	Tues. Th. and Sat	May 1, and Nov. 1.

Funds.	Transfer days.	Dividends due.
Irish 5 per Cent. Annuities......................	Tues. Th. and Sat.....	March 25, and
Irish Terminable Annuities......................	Tues. Th. and Sat.....	Sept. 25.

Transferable at the South Sea House.

South Sea Stock................	Mon. Wed. and Fr....	January 5, and July 5.
New South Sea Annuities..	Tues. Th. and Sat....	January 5, and July 5.
Three per Cent. Annuities, 1751................	Tues. and Thurs....	
Old South Sea Annuities...............	Mon. Wed. and Fr...	April 5, and Oct. 10.

In these several funds, but particularly in the consolidated 3 per cents, which is by far the greatest in amount, much business is transacted daily both at the Bank and at the Stock Exchange, a building erected expressly for the buyers and sellers of the public funds to assemble in. Persons having occasion to invest money in the funds usually employ a broker, who finds a seller of the stock wanted, and having agreed upon the price, delivers the particulars of the transfer to be made to a clerk in the proper office at the Bank, and fills up a receipt to be signed by the seller for the money paid. The transaction is completed in a short time, with very little trouble to the parties, and this facility of buying into or selling out of the funds induces many persons to lay out their money therein in preference to all other securities. The transfer from the seller to the buyer is made free of all expence to the parties, on all the government funds; but transfers of the funds of any company or society are liable to a duty. Transfers are made at the Bank between the hours of eleven and one o'clock; but may be made till three o'clock on payment of a small-fee to the clerks.

The following table will shew, at one view, the intrinsic value per cent. of the several public funds, in proportion to the different rates of interest they bear, by which any person may know in what fund it will be most advantageous to purchase.

3	3½	4	4½	5	5½	8	Years Purchase.	Annual Interest. *l.*	*s.*	*d.*
57	66½	76	84½	95	104½	152	19	5	5	3
58½	68¼	78	86¾	97½	107¼	156	19½	5	2	8
60	70	80	90	100	110	160	20	5	0	0
61½	71¾	82	92¼	102½	112¾	164	20½	4	17	6
63	73½	84	94½	105	115½	168	21	4	15	2
64½	75¼	86	96¾	107½	118¼	172	21½	4	13	0
66	77	88	99	110	121	176	22	4	10	10
67½	78¾	90	101¼	112	123¾	180	22½	4	8	10
69	80½	92	103½	115	126½	184	23	4	6	11
70½	82¼	94	105¾	117½	129¼	188	23½	4	5	1
72	84	96	108	120	132	192	24	4	3	4
73½	85¾	98	110¼	122½	134¾	196	24½	4	1	7
75	87½	100	112½	125	137½	200	25	4	0	0
76½	89¼	102	114¾	127½	140¼	204	25½	3	18	5
78	91	104	117	130	143	208	26	3	16	11
79½	92¾	106	119¼	132½	145¾	212	26½	3	15	5
81	94½	108	121½	135	148½	216	27	3	14	0
82½	96¼	110	193¾	137½	151¼	220	27½	3	12	8
84	98	112	126	140	154	224	28	3	11	4
85½	99¾	114	128¼	142½	156¾	228	28½	3	10	2
87	101½	116	130½	145	159½	232	29	3	9	0
88½	103¼	118	132¾	147½	162¼	236	29½	3	7	9
90	105	120	135	150	165	240	30	3	6	8

Explanation. The first column towards the left hand contains the three per cents. Now 100*l.* in the 3 per cent. annuities purchased for 57*l.* will bring the purchaser the same annual interest, (5*l.* 5*s.* 3*d.*) for his money, as 100*l.* in any of the other funds, purchased at the respective prices in

the same parallel line with 57. Again. Suppose I find in the newspapers that 3 per cent. annuities sell for $70\frac{1}{2}$, and bank stock ($5\frac{1}{2}$ per cent.) sells for $140\frac{1}{4}$, which of these will bring me a greater annual interest, and what interest will each of them produce?.... In the eleventh line of the first column, containing the 3 per cents, I find $70\frac{1}{2}$, and in the last column of the same line I find that the 3 per cents purchased at $70\frac{1}{2}$, produce 4*l.* 5*s.* 1*d.* per annum. Then, in the sixth column of the same line, containing the bank-stock, I find $129\frac{1}{4}$, which shews, that when the 3 per cents are at $70\frac{1}{2}$, bank stock, which pays $5\frac{1}{2}$ per annum, is worth only $129\frac{1}{4}$, consequently the price of *that* stock in the papers is 11*l.* too dear: and as against $140\frac{1}{4}$*l.* in the $5\frac{1}{2}$ per cent. column, we find 3*l.* 18*s.* 5*d.* annual interest of 100*l.* laid out in bank stock at *that* rate, while the 3 per cents at the same time would produce 4*l.* 5*s.* 1*d.*

Sinking Fund.—The surplusses of the three great national funds, the aggregate, general, and South sea funds, over and above the interest and annuities charged upon them, are directed by statute 3 Geo. I. c. 7. to be carried together, and to attend the disposition of parliament; and are usually denominated the sinking fund, because originally destined to sink and lower the national debt. To this have been since added many other entire duties, granted in subsequent years; and the annual interest of the sums borrowed on their respective credits is charged on, and payable out of, the produce of the sinking fund. However, the nett surplusses and savings, after all deductions paid, amount annually to a very considerable sum. For, as the interest on the national debt has been at several times reduced (by the consent of the proprietors, who had their option either to lower their interest or be paid their principal), the savings from the appropriated revenues must needs be extremely large.

But, before any part of the aggregate fund (the surplusses whereof are one of the chief ingredients that form the sinking fund) can be applied to diminish the principal of the public debt, it stands mortgaged by parliament to raise an annual sum for the maintenance of the king's household and the civil list. For this purpose, in the late reigns, the produce of certain branches of the excise and customs, the post-office, the duty on wine-licences, the revenues of the remaining crown-lands, the profits arising from courts of justice, (which articles include all the hereditary revenues of the crown), and also a clear annuity of 120,000*l.* in money, were settled on the king for life, for the support of his majesty's household, and the honour and dignity of the crown. And, as the amount of these several branches was uncertain, (though in the last reign they were computed to have sometimes raised almost a million,) if they did not arise annually to 800,000*l.*, the parliament engaged to make up the deficiency. But his present majesty having, soon after his accession, spontaneously signified his consent that his own hereditary revenues might be so disposed of as might best conduce to the utility and satisfaction of the public, and having graciously accepted a limited sum, the said hereditary and other revenues are now carried into, and made a part of, the aggregate fund; and the aggregate fund is charged with the payment of the whole annuity to the crown. The limited annuity accepted by his present majesty was at first 800,000*l.* but it has been since augmented to 900,000*l.* The expenses themselves, being put under the same care and management as the other branches of the public patrimony, produce more, and are better collected than heretofore; and the public is a gainer of upwards of 100,000*l.* per annum by this disinterested bounty of his majesty.

The sinking fund, though long talked of as the last resource of the nation, proved very inadequate to the purpose for which it was established. Ministers found pretences for diverting it into other channels; and the diminution of the national debt proceeded slowly during the intervals of peace, whilst each succeeding war increased it with great rapidity. To remedy this evil, and restore the public credit, to which the American war had given a considerable shock, Mr. Pitt conceived a plan for diminishing the debt by a fund, which should be rendered unalienable to any other purpose. In the session 1786, he moved that the annual surplus of the revenue above the expenditure should be raised, by additional taxes, from 900,000*l.* to one million sterling, and that certain commissioners should be vested with the full power of disposing of this sum in the purchase of stock for the public, in their own names. These commissioners should receive the annual million by quarterly payments of 250,000*l.*, to be issued out of the exchequer before any other money, except the interest of the national debt itself; by these provisions, the fund would be secured, and no deficiencies in the national revenues could affect it, but such must be separately provided for by parliament.

The accumulated compound interest on a million yearly, together with the annuities that would fall into that fund, would, he said, in twenty-eight years amount to such a sum as would leave a surplus of four millions annually, to be applied, if necessary, to the exigencies of the state. In appointing the commissioners, he should, he said, endeavour to choose persons of such weight and character as corresponded with the importance of the commission they were to execute. The speaker of the house of commons, the chancellor of the exchequer, the master of the rolls, the governor and deputy governor of the Bank of England, and the accountant-general of the high court of chancery, were persons who, from their several situations, he should think highly proper to be of the number.

To the principle of this bill no objection was made, though several specious but ill-founded ones were urged against the sufficiency of the mode which the chancellor of the exchequer had adopted for the accomplishment of so great and so desirable an end. He had made it a clause in his bill, that the accumulating million should never be applied but to the purchase of stock. To this clause Mr. Fox objected, and moved that the commissioners therein named should be impowered to accept so much of any future loan as they should have cash belonging to the public to pay for. This, he said, would relieve that distress the country would otherwise be under, when, on account of a war, it might be necessary to raise a new loan: whenever that should be the case, his opinion was, that the minister should not only raise taxes sufficiently productive to pay the interest of the loan, but also sufficient to make good to the sinking fund whatsoever had been taken from it.

If, therefore, for instance, at any future period a loan of six millions was proposed, and there

was at that time one million in the hands of the commissioners, in such case they should take a million of the loan, and the bonus or douceur thereupon should be received by them for the public. Thus government would only have five millions to borrow instead of six, and from such a mode of proceeding, he said, it was evident great benefit would arise to the public.

This clause was received by Mr. Pitt with the strongest marks of approbation, as was likewise another, moved by Mr. Pulteney, enabling the commissioners named in the bill to continue purchasing stock for the public when it is above par, unless otherwise directed by parliament. With these additional clauses the bill was read a third time on the 15th of May, and carried up to the lords, where it also passed without meeting with any material opposition, and afterwards received the royal assent.

The operation of this bill surpassed perhaps the minister's most sanguine expectation. The fund was ably managed, and judiciously applied; and in 1793 the commissioners had extinguished some millions of the public debt. The war, however, into which the nation was that year involved, has made it necessary to borrow additional sums, so large, that many years of peace must elapse before the operation of the fund can contribute sensibly to the relief of the people.

The income of the whole sinking fund, on the 1st of February, 1802, was 5,809,330*l.* The whole sum which had been paid for the purchase of stock, up to that period, was 38,110,795*l.*

It has been said, that when money is wanted for defraying public expences, it makes no difference whether it is obtained by diverting the sinking fund, or by a new loan. There cannot be a worse fallacy than this. Money in a sinking fund, if never alienated, is improved at compound interest; but, when procured by a loan, bears only simple interest. A nation, therefore, whenever it applies the income of such a fund to current expences rather than the redemption of its debts, chooses to lose the benefit of compound interest in order to avoid paying simple interest; and the loss in this case is equal to the difference between the increase of money at compound and simple interest. The following calculation will shew what this difference is.

One penny put out at our Saviour's birth to five per cent. compound interest, would, before the year 1779, have increased to a greater sum than would be contained in a hundred and fifty millions of earths, all solid gold. But, if put out to simple interest, it would, in the same time, have amounted to no more than seven shillings and six-pence. All governments that alienate funds destined for reimbursements, choose to improve money in the last rather than the first of these ways.

FUNDAMENT, in anatomy, the lowest part of the intestinum rectum, called by anatomists the anus.

FUNDAME'NTAL. *a.* Serving for the foundation; that upon which the rest is built; essential; important (*Raleigh*).

FUNDAMENTAL BASS. (See BASS.) To what is there mentioned, we now add a few practical rules for the procedure of the fundamental bass. It ought never to sound any other notes than those of the series or tone in which the composer finds himself, or at least those of the series or tone to which he chooses to make a transition. This of all the rules for the fundamental bass is the most indispensable. By the second, its procedure ought to be so implicitly subjected to the laws of modulation, as never to suffer the idea of a former mode to be lost till that of a subsequent one can be legitimately assumed; that is to say, that the fundamental bass ought never to suffer us to be one moment at a loss in what mode we are. By the third, it is subjected to the connection of chords and the preparation of dissonances: a manœuvre which is nothing else but a method of producing this connection, and which of consequence is only necessary when the connection cannot subsist without it. By the fourth, it is necessitated, after every dissonance, to pursue that career which the resolution of the dissonance indispensably prescribes. (See RESOLUTION.) By the fifth, which is nothing but a consequence of the former, the fundamental bass ought only to move by consonant intervals; except alone in the operation of a broken cadence, or after a chord of the seventh diminished, where it rises diatonically. By the sixth, in short, the fundamental bass or harmony ought not to be syncopated; but to distinguish the bars and the times which they contain, by changes of chords properly marked with cadences; in such a manner, for instance, that the dissonances which ought to be prepared may find their preparation in the imperfect time, but chiefly that all the reposes may happen in the perfect time. The sixth rule is liable to exceptions: nevertheless it is always kept in view by every judicious composer.

FUNDAMENTAL NOTE, in music. See KEY.

FUNDAME'NTALLY. *ad.* Essentially; originally.

FUNDY (Bay of), is seated between New Hampshire and Nova Scotia, celebrated on account of its fishery.

FUNEN, an island of Denmark, seated on the Baltic sea. It is fertile in wheat and barley.

FU'NERAL. *s.* (*funerailles*, French.) 1. The solemnization of a burial; the payment of the last honours to the dead; obsequies (*Sandys*). 2. The pomp or procession with which the dead are carried (*Swift*). 3. Burial; interment (*Denham*).

FU'NERAL. *a.* Used at the ceremony of interring the dead (*Denham*).

FUNERAL RITES, ceremonies accompanying the interment or burial of any person. The word is formed of the Latin *funus*, and that of *funalia*, on account of the torches (which were *funes cera circumdati*) used in the funerals of the Romans; though others derive *funus* from the Greek φονος, death or slaughter. These rites differed among the ancients according to the different genius and religion of each country. The first people who seem to have paid any particular respect to their dead were the Egyptians, the posterity of Ham. The first cultivators of idolatrous worship and superstition after the flood; they were also the

first who asserted the immortality of the soul, its migration into all kinds of animals in earth, air, and sea, and its return to the human body; which they supposed to be within the term of 3000 years. Hence proceeded their very great care in embalming of their dead bodies, and their being at such vast expence, as they were, in building proper repositories for them; for they were more solicitous about their graves than their houses. This gave birth to those wonders of the world, the pyramids, which were built for the burial of their kings, with such vast charges, and almost incredible magnificence. See PYRAMID.

The funeral rites among the Hebrews were solemn and magnificent. When any person was dead, his relations and friends rent their clothes; which custom is but faintly imitated by the modern Jews, who only cut off a bit of their garment, in token of affliction. It was usual to bend the dead person's thumb into the hand, and fasten it in that posture with a string; because the thumb then having the figure of the name of God, they thought the devil would not dare to approach it. When they came to the burying-place, they made a speech to the dead in the following terms: "Blessed be God, who has formed thee, fed thee, maintained thee, and taken away thy life!—O dead! he knows your numbers, and shall one day restore your life, &c." Then they spoke the elogium, or funeral oration, of the deceased; after which they repeated a prayer, called the Righteousness of Judgment; then turning the face of the deceased towards heaven, they called out, "Go in peace."

The ancient Christians abhorred the pagan custom of burning their dead, and always deposited the body entire in the ground: and it was usual to bestow the honour of embalming upon the martyrs at least, if not upon others. They prepared the body for burial, by washing it with water, and dressing it in a funeral attire. The exportation or carrying forth of the body was performed by near relations, or persons of such dignity as the circumstances of the deceased required. Psalmody, or singing of psalms, was the great ceremony used in all funeral processions among the ancient Christians.

In the Romish church, when a person is dead, they wash the body, and put a crucifix in its hand. At its feet stands a vessel full of holy water, and a sprinkler, that they who come in may sprinkle both themselves and the deceased. In the mean time some priest stands by the corpse, and prays for the deceased till it is laid in the earth. In the funeral procession, the exorcist walks first, carrying the holy water; next the cross-bearer, afterwards the rest of the clergy, and last of all the officiating priest. They all sing the *miserere*, and some other psalms; and at the end of each psalm a *requiem*. We learn from Alet's ritual, that the faces of deceased laymen must be turned towards the altar, when they are placed in the church; and those of the clergy towards the people. The corpse is placed in the church surrounded with lighted tapers: after the office for the dead, mass is said; then the officiating priest sprinkles the corpse thrice with holy water, and as often throws incense on it. The body being laid in the grave, the friends and relations of the deceased sprinkle the grave with holy water.

The funeral ceremonies of the ancient Greeks and Romans were very numerous: for a description of them we must refer to the well-known books of Potter, Kennett, and Adams; and shall conclude this article with pointing out an abuse in the modern practice of burying in our metropolis, which loudly claims the attention of the legislature. In many populous parishes, within the bills of mortality, a dangerous practice prevails, of excavating pits (graves they cannot be called) for the reception of the deceased poor, who being packed in four deal boards loosely nailed together, are there deposited till the hole is sufficiently filled. During the interval planks are laid over this common receptacle; and when the uppermost coffin arrives, a minister is employed to mutter, at once, the usual prayers, over the hapless victims of poverty. Such mal-practice demands an immediate remedy; as the mephitic vapours arising through the planks, especially during summer, have the most noxious properties; and have probably caused the premature death of many. Facts like these, we agree with Dr. Willich (Domes. Encyclo.) in thinking it our duty to state, on account of their immediate influence on the health of every inhabitant of London.

FUNERAL-COLUMN, a column crowned with an urn, wherein the ashes of some deceased person are supposed to be enclosed; the shaft being beset with tears and flames, the symbols of grief and immortality.

FUNERAL-GAMES, a part of the ceremony of the ancient funerals. It was customary for persons of quality among the ancient Greeks and Romans to institute games, with all sorts of exercises, to render the death of their friends more remarkable. This practice was generally received, and is frequently mentioned by ancient writers. Patroclus's funeral games take up the greater part of one of Homer's Iliads; and Agamemnon's ghost is introduced by the same poet, telling the ghost of Achilles that he had been a spectator at a great number of such solemnities.

FUNERAL ORATION, OR SERMON, a discourse pronounced in praise of a person deceased, at the ceremony of his funeral.

The custom of making funeral orations is very ancient. The Romans had it of a long standing; and it was always one of the nearest relations that made the harangue. Augustus did the office to his grandmother Julia, when only twelve years of age. Suet. Aug. cap. 8. And we have divers parallel instances.

Funeral sermons and orations among Christians. In all compositions of this sort from the pulpit, there is one thing in which we should take care to follow the ancients; and that is, not to make sermons or orations indiscriminately, but for those only whose charac-

ters are distinguished, and who have been eminently useful in the world. The old heathens honoured those alône with this part of the funeral solemnity who were men of probity and justice, renowned for their wisdom and knowledge, or famous for warlike exploits: this, as Ciceroinforms us, being part of t e law for burials, which directs that the praises only of honourable persons shall be mentioned in the oration. It would be much more agreeable, therefore, if our funeral discourses were not so common, and if the characters given of the deceased were strictly just, and devoid of that fulsome flattery with which they are too often interlarded. The most eloquent funeral orations yet known are those of Bossuet.

FUNE'REAL. *a.* (*funerea*, Latin.) Suiting a funeral; dark; dismal (*Pope*).

FUNGI, funguses, or mushrooms. The first of the great families; and the ninth of the nations, tribes, or casts, into which Linnéus has distributed the whole vegetable world. Also the sixty-seventh order in his Fragments of a Natural Method: the fifty-eighth of his Natural Orders; and the fourth order of the class cryptogamia, in his Artificial System.

FUNGO'SITY. *s.* (from *fungus*.) Unsolid excrescence.

FU'NGOUS. *a.* (from *fungus*.) Excrescent; spongy; wanting firmness (*Sharp*).

FU'NGUS. (*fungus*.) Proud flesh. A term in surgery to express any luxuriant formation of flesh.

FUNGUS IGNIARIUS. See AGARICUS.

FUNGUS LARICIS. See AGARICUS ALBUS.

FUNGUS MELITENSIS. This is improperly called a fungus, it being the cinomonium coccineum of Linnéus. A drachm of the powder is given for a dose in dysenteries and hæmorrhagies, and with remarkable success.

FUNGUS ROSACEUS. See BEDGUAR.

FUNGUS SALICIS. The willow fungus. The species of fungus ordered in some pharmacopœias by this name is the boletus suaveolens; acaulis superne lævis, salicibus, of Linnéus, and the boletus albus of Hudson. When fresh, it has a suburinous smell, and at first an acid taste, followed by a bitter. It is seldom used at present, but was formerly given in phthisical complaints.

FUNGUS SAMBUCINUS. See AURICULA JUDÆ.

FUNGUS VINOSUS. The dark cobweb-like fungus, which vegetates in dry cellars, where wine, ale, and the like, are kept.

FUNICULUS UMBILICALIS. (*funiculus*, dim. of *funis*, a cord.) See UMBILICAL CORD.

FU'NICLE. *s.* (*funiculus*, Latin.) A small cord.

FUNI'CULAR. *a.* (*funiculaire*, French.) Consisting of a small cord or fibre.

FUNK. *s.* A stink.

FU'NNEL. *s.* (*infundibulum*, Latin.) 1. An inverted hollow cone with a pipe decending from it, through which liquors are poured into vessels (*Ben Jonson*). 2 A pipe or passage of communication (*Addison*).

FUR. *s.* (*fourrure*, French.) 1. Skin with soft hair, with which garments are lined for warmth (*Swift*). 2. Soft hair of beasts found in cold countries; hair in general (*Ray*). 3 Any moisture exhaled to such a degree as that the remainder sticks on the part (*Dryden*).

To FUR. *v. a.* (from the noun.) 1. To line or cover with skins that have soft hair (*Sid.*). 2. To cover with soft matter (*Philips*).

FUR-WROUGHT. *a.* Made of fur (*Gay*).

With respect to its influence on health, we shall briefly remark, that fur deserves no commendation as an article of ordinary dress. Its alkaline and oily particles stimulate the skin, when in contact with it; thus partially increase perspiration, and lay the foundation of colds and catarrhs. A fur dress readily attracts infection, and acquires an intolerable smell. Hence whole nations that wear such garments are exposed to obstinate cutaneous diseases, and, perhaps, to the propagation of the plague itself; which is said to be spread among the Turks, chiefly by their absurd cumbersome dresses lined with animal hair. See FURR.

FURA'CIOUS. *a.* (*furax*, Lat.) Thievish.

FURA'CITY. *s.* (from *furax*, Latin.) Disposition to theft; thievishness.

FU'RBELOW. *s.* A piece of stuff plaited and puckered together, either below or above, on the garments of women (*Pope*).

To FU'RBELOW. *v. a.* (from the noun.) To adorn with ornamental appendages of dress.

To FU'RBISH. *v. a.* (*fourbir*, French.) To burnish; to polish (*South*).

FU'RBISHER. *s.* (*fourbisseur*, Fr.) One who polishes any thing.

FURCA, FORK, in antiquity, an instrument of punishment, among the Romans. The form of the Roman furca is very obscurely described by the ancients, and much controverted by the moderns. All we know for certain is, that it was of wood, and resembled a fork.

FURCATION. *s.* (*furca*, Lat.) Forkiness; the state of shooting two ways like the blades of a fork (*Brown*).

FURETIERE (Anthony), a learned Frenchman, born at Paris in 1620. After practising with reputation as an advocate, he entered into orders, and became abbot of Chalivoy and prior of Chuines. He was expelled from the French academy for publishing his universal dictionary of the French tongue, which that society pretended was meant to supersede their own. He died in 1688.

FURINI (Francesco), an eminent historical painter, born at Florence in 1604, and died in 1646. He excelled in painting naked figures, as nymphs bathing, &c. which he executed with greater elegance than decency.

FURIUS, surnamed Bibaculus, an old Latin poet, born at Cremona about 100 B.C. He wrote annals and satires, but only some fragments are now extant, to be found in Macrobius.

FURFUR. (*furfur*, meal.) Bran. A dis-

ease of the skin, in which the cuticle keeps falling off in small scales like bran.

FURFURACEOUS. (*furfuraceus*, from *furfur*, bran.) A term applied to branny scales on the skin: also to the sediment deposited in the urine of persons afflicted with fever, of a reddish or whitish matter, which generally appears within an hour or two after the urine is passed, and only falls in part to the bottom, the urine remaining turbid.

FURIA, in zoology, a genus of the class vermes, order intestina. Body linear, equal, filiform, and ciliate on each side with a single row of reflected prickles pressed close to the body. One species only; F. infernalis: inhabits the vast marshy plains of Bothnia and Finland; where it crawls up shrubs and sedge-grass, and being carried forwards by the wind, penetrates suddenly into such exposed parts of men and horses as are not perpendicularly situated. It quickly buries itself under the skin, leaving a black point where it had entered; which is soon succeeded by the most excruciating pains, inflammation and gangrene of the part, swooning and death. This all occurs in the course of a day or two, frequently within a few hours, unless the animal be imimmediately extracted; which is effected with great caution and difficulty, by applying a poultice of curds or cheese; or by carefully dissecting between the muscle in the course it entered.

FURIES, in pagan antiquity. See EUMENIDES.

FURINA, the goddess of robbers, worshipped at Pagan Rome. Her festivals were called Furinalia or Furineia.

FURIOSO, a musical term, applied to movements which are intended to be played with a degree of energy bordering upon fury.

FU'RIOUS. *a.* (*furieux*, French; *furiosus*, Latin.) 1. Mad; phrenetic (*Hooker*). 2. Raging; violent; transported by passion beyond reason (*Shakspeare*). 3. Violent; impetuously agitated (*Milton*).

FU'RIOUSLY. *ad.* Madly; violently (*Spenser*).

FU'RIOUSNESS. *s.* (from *furious*.) Phrensy; madness; transport of passion.

To FURL. *v. a.* (*fresler*, French.) To draw up; to contract (*Creech*).

FU'RLONG. *s.* (fuplang. Saxon.) A measure of length; the eighth part of a mile.

FU'RLOUGH. *s.* (*verloef*, Dutch.) A temporary dismission from military service (*Dry.*).

FU'RMENTY. *s.* See FRUMENTY. (*Tusser*).

FURNACE. An apparatus for the purpose of exciting and maintaining vehement combustion, whether by coal, charcoal, wood, turf, coak, or cinders.

As heat is one of the great agents in chemical processes, the peculiar mode of constructing such an apparatus is a question of the utmost consequence; and, accordingly, a vast quantity of pains and ingenuity has been bestowed on this subject. In all furnaces, however, the chief points to be attended to are the following: 1. To confine the heat as much as possible to the matter to be operated upon. 2. To prevent its being dissipated. 3. To produce as much heat with as little fuel as possible: and, 4. To have it in our power to regulate the degree of heat according to our pleasure.

To answer the first intention, the fire is usually confined in a chamber or cavity built on purpose for it, and furnished with a door for putting in the fuel; a grate for supporting it, and allowing air to pass through, as well as the ashes to drop down into a cavity provided on purpose, and called the ash-pit. Thus the heat produced by the inflamed fuel is confined by the sides of the furnace, and obliged to spend great part of its force upon the subject inclosed.

The second intention, viz. that of preventing a dissipation of the heat, is obtained by shutting the door of the furnace, taking care that the chimney be not too wide, and that the matter to be acted upon be placed in such a manner that the fire may have its full effect upon it as it goes up the chimney.

The third intention, which is the most important, is at the same time the most difficult to answer, and is altogether regulated by the proportion between the spaces betwixt the furnace bars and the wideness and height of the chimney. This will appear from a consideration of the principles on which the degrees of inflammation are produced. These depend entirely on the current of air which passes through the inflamed fuel. As soon as the fuel is set on fire, a certain degree of heat is produced; but unless a constant influx of air be admitted through the burning fuel, the fire is instantly extinguished; nor is it possible by any means to renew the inflammation until we admit a stream of fresh air among the fuel. When this is done, a rarefaction commences in the air of the fire-place of the furnace; so that it is no longer a counterpoise to the external air, and is therefore driven up the chimney by that which enters at the ash-pit. This again passing through the fuel is rarefied in its turn; and giving place to fresh quantities, there is a constant flow of air up the chimney. In proportion to the rarefaction of the air in the fire-place, the greater is the heat. But by a certain construction of the furnace, the under part of the chimney will become almost as strongly heated as the fire-place; by which means, though a very strong current of air be forced through the fuel, yet as great part of the heat is spent on the chimney, where it can be of no use, the fuel is wasted in a very considerable degree. To avoid this, we have no other method than to contract the throat of the chimney occasionally by a sliding plate; which when put quite in shuts up the whole vent, and, by being drawn out more or less, leaves a larger or smaller vent at pleasure. This plate ought to be quite drawn out till the fuel is thoroughly kindled, and the furnace well heated, so that a current of air may flow strongly through the fuel. After this the plate is to be put in a certain length, so as just to prevent the

smoke from coming out at the door of the furnace. The rarefaction of the air in the fire-place will solicit a very considerable draught of air, which will keep the fuel inflamed to a great degree; at the same time that the heat, being reflected from every part of the furnace excepting that narrow passage where the smoke goes up, becomes very intense. A large quantity of fuel may be put in at once, which will consume slowly, and thus require but little attention in comparison with those furnaces where no such precaution is used. The sliding-plate may be made of cast-iron in those furnaces where no great heat is excited; but in others fire-clay will be more convenient. The contrivance, however, is scarce applicable to those furnaces where great quantities of metal are to be melted; and accordingly the waste of fuel here is immense. It is computed, that the iron-works of Carron in Stirlingshire consume annually as many coals as would be sufficient for a city containing 700,000 inhabitants. The sliding-plate is now introduced into the chimneys of our sugar-baking houses.

The fourth intention, viz. that of regulating the heat, is accomplished by allowing only a certain quantity of air to pass through the fu[illegible] For this purpose, according to Dr. Black, it is necessary to have the command of the furnace below; the parts above being frequently filled with small quantities of soot. The best method of managing this is to shut up the door of the ash-hole perfectly close, and to have a set of round holes bearing a certain proportion to one another; and their areas being as 1, 2, 4, 8, 16, &c. Seven or eight of these ought to be made in the door of the ash-pit, which will give a sufficient command over the fire. When the fire is to be increased to the utmost, all the passages both above and below are to be thrown open, and the height of the vent augmented; which, by increasing the height of the column of rarefied air, increases also the motion of that through the fuel, and of consequence also the heat of the furnace. Macquer recommends another tube applied to the ash-pit, widest at the end farthest from the furnace, and tapering gradually towards it. The intention of this is to augment the current and velocity of the air by its being made to pass from a wider into a narrower vent; but though this is no doubt true, the air will not ultimately move with greater velocity than if the tube were not there. It can only be useful, therefore, in cases where the furnace is placed in a small room, and the tube itself has a communication with the external air.

The fuels employed in furnaces are of different kinds, according to the nature of the furnace, or the material to be operated upon: hence we have wood, charcoal, coal, coak, coal-cinders, culm or Welsh coal, Kilkenny coal, and turf.

Wood faggots give a strong, clear flame, unmixed with sulphur and with but little smoke, and burn to a clean ash, which also is valuable for the alkali it contains.. Its chief disadvantages are its extreme bulkiness, and the labour of conveying a constant supply of it, as also the larger size of the furnace that is to contain it.

Charcoal is a most valuable fuel. It kindles readily, burns with a strong, clear heat, and requires a much less draught of air for combustion than coak or charred coal; it contains no sulphur nor any earthy or metallic matter, and hence never runs into a hard vitreous slag as coak does, nor choaks up the draught of air, nor melts down the clay walls of the furnace when constructed of this material. Its chief disadvantages are that it is expensive, burns out very rapidly, so as to require an almost constant supply, and is so light as not to bear a strong blast of air excepting in very large masses that are inconvenient.

Coal is the substance most generally used in our own country for all manufacturing purposes where a moderate heat is wanted, and where the smoke, by means of a chimney, can be put out of contact with the substance operated upon, as in brewers and distillers coppers, or where the smoke is of no consequence. It gives a large, strong, and lasting flame; but for any intensity of heat, it requires a large and high chimney, and a wide ash-hole.

Coak gives a very strong heat without flame, and is the material generally employed for strong wind and blast furnaces, where an intense and durable heat is required. Its combustion is very much improved by addin[g] an equal bulk of charcoal to it.

Coal-cinders, picked from a common fire, by removing the coal just when it ceases to blaze and before it begins to burn to ashes, is often preferable to coak for laboratory experiments; it gives forth less sulphur and burns more readily. The best Newcastle coal, which is highly bituminous, yields the most valuable cinder for this purpose.

Culm, or *Welsh coal*, in burning gives neither flame nor smoke, and makes but little residue. It answers very well, therefore, in most cases in which charcoal succeeds, and is not so readily dispersed by blasts of air.

Kilkenny coal is nearly of the same nature, but not quite so pure.

Turf is seldom used; yet it may be usefully employed for long digestions with a very gentle warmth, as being attended with a very small expence. At present, these operations are performed by the lamp, which is preferable on many accounts, and especially in consequence of the pungent smoke which turf is so apt to give forth.

Among the furnaces which have been most approved we may mention the following.

Dr. Black's Portable Furnace. In its improved state this consists of an oval iron case twenty-two inches high, twenty in its largest diameter, and fifteen in its shortest, lined with fire-bricks for about three-fourths of its height from the top, which forms the body of the furnace, and the first elbow of the chimney, whilst the lower part which is not lined forms a very spacious ash-pit. Being very heavy, it is put upon castors, by which, with the assistance

of the ring-handles on the sides, it may be moved along a floor without difficulty. A great variety of operations, and on a tolerably large scale, may be performed in this useful furnace, which is very durable, and from its weight and solidity not liable to be damaged by external blows, or easily displaced.

The Portable Chamber Furnace is of a much smaller size, and generally employed in lecture rooms; it is usually fitted for a great variety of purposes. Its upper part often consists of a rounded dome terminated by a perpendicular iron flue.

The best *Muffle Furnace* for a very intense heat is that first employed by Pott, and afterwards by Darcet in experiments on the habitudes of earths and stones in long continued and violent heat. The construction is simple; the body is the form of an oblong coffer bulging out in the middle, the hole for the muffle is also in the middle; and the draught is raised by a long perpendicular chimney.

The Reverberating Furnace is used for roasting and smelting ores: and in this the substance to be heated is not in actual contact with the fuel, but strewed on a separate floor or hearth placed between the fuel and the chimney, and is heated by the flame in its passage through.

The reverberating furnace is shewn in fig. 2 and 3, Plate 80. The fuel, which is raw pit coal, is placed upon the fire-grate AA, situated over an arch, having free communication with the open air. The coals are introduced through the hole BB: this has no fire door, but in lieu, the aperture is closed up with fresh coals; and when the fire requires a supply of coals, the stoker shoves some of the coals into the fire, and stops up the hole with fresh coals. This forms an effectual stoppage to the air, and obliges it to pass through the grate and the flaming fuel laid upon it. The grate is covered over with a dome of fire-brick, DD; and upon one side of the grate a wall EE of fire-brick is raised, which is called the bridge. Behind this is the floor of the furnace FF, an inclined plane leading from the top of the bridge to the bottom of the chimney HH, which is lined with fire-brick, and carried up about 30 feet above the fire-grate. K, is the door to introduce the iron or matter to be heated, which is placed upon the inclined floor of the furnace, opposite, or rather a little higher up, than the door, which is now closed, and the fire lighted, upon the grate AA. The smoke and heated air from the fire proceeds along the body of the furnace up the chimney, and heating the air contained therein, the draught takes place by a column 30 feet high of rarefied air in the chimney; which being lighter than the cold air, the flame is forced up the chimney by the weight of the atmosphere pressing upwards through the fire-grate in a rapid stream, which parts with its oxygen to the fire, while the remainder passes up the chimney in a rarefied state. When the fire burns fiercely, its flame rises up against the dome D, and is thereby reflected down upon the floor with exceeding great force, and quickly heats any matter placed there. A furnace of this kind will fuse 30 cwt. of pig iron in about three hours; the furnace being previously heated red before the charge of metal is introduced. The fluid metal runs down the floor F, and accumulates below, when it is laded out through the door L, which is then opened; or it is suffered to run out through a hole at K, which was before stopped with sand. The floor of the furnace is composed of sand, which in some degree vitrifies without running; and every time before the furnace is used, the stoker rakes the sand into such a form as will suit best for the quantity of metal to be fused. When the reverberating furnace is used for heating iron or other matter without melting, its floor is made level; but its operation is exactly the same. The brick-work of the furnace is surrounded with iron plates, and kept together by long bolts, as shewn in the plan. An air or wind furnace for crucibles is described in Brass foundery; but the shape of its body is adapted to the number of crucibles it is to contain.

Refining Furnace. This consists of the following parts. 1. Masonry of the pillars and walls surrounding the furnace. 2. Channels for carrying off the moisture. 3. Other small channels which join in the middle of the bason. 4. Bason made of bricks. 5. Bed of ashes. 6. A hollow or bason in which the metal is melted and refined. 7. Great flame-hole. 8. Two openings for the entry of the tuyeres of the bellows. 9. Vault or dome of the furnace. 10. Fire-place. 11. Grate. 12. Draught-hole. 13. A hole in the vault, which, being opened, serves to cool the furnace.

The Blast Furnace, or, as it is sometimes termed, *Cupola*, is constructed within a cast-iron cylinder AA, fig. 1, Plate 80, by lining it with glass-grinder's sand; which being intermixed with small particles of glass, vitrifies with the first heating, and forms an excellent lining. The internal cavity is of a cylindric shape, and has a tap-hole B at the bottom, to let out the melted matter; at D is the blowing hole, or tuire, through which the blast of air is introduced by the nose F, of the bellows FGH, which are double. The lower part GH is moved up and down by the lever IK, which a labourer works and forces the air into the upper part FG; from whence it is expressed by the weight *a* into the furnace. By means of the double bellows the stream of air is constantly supplied without any material intermission. For the fusion of iron, the fuel is coke or charcoal, which is put in at the top, and the iron in fragments at the same time: the coke is lighted by first putting down a few hot coals, and blowing the bellows. In the course of half an hour the metal begins to drop down through the cokes, and accumulates in the bottom of the furnace until the whole quantity follows. It is then let out by removing the sand with which the tap-hole B was rammed up. For experiments, or for melting more valuable metals, a crucible is let down into the furnace with tongs, as described in Brass foundery.

Many of our practical chemists of the present day have their laboratories stocked with a variety of furnaces, communicating very ingeniously where it is necessary with one common chimney, and are thus competent to make any experiments with the greatest ease and least expence. One of the best of this kind is that belonging to Mr. Pepys, which exhibits elegance as well as convenience. The set of furnaces in this laboratory consists of a still with its worm-tub; a forge-hearth; a muffle-furnace; a strong draught-furnace for melting; a furnace for naked distillation; a square sand-bath for digestions; and a round sand-bath for distillations.

Machines for blowing Air into Furnaces. The earliest method of animating large fires in the furnaces where ores were smelted seems to have been by exposing them to the wind. Such was the practice of the Peruvians before the arrival of the Spaniards among them. Alonso Barba relates, that their furnaces, called guairas, were built on eminences, where the air was freest; that they were perforated on all sides with holes, through which the air was driven in when the wind blew, which was the only time when the work could be carried on; that under each hole was made a projection of the stone work, on which were laid burning coals, to heat the air before it entered the furnace. Some authors speak of several thousands of these guairas burning at once on the sides and tops of the hills of Potosi; and several remains of this practice are to be found in different parts of Great Britain.

This method of supplying air being found generally ineffectual and precarious, the instruments called bellows succeeded. These were at first worked by the strength of men; but as this was found to be very laborious and expensive, the force of running water was employed to give motion to these machines. Thus a much greater quantity of metal could be procured than formerly, and the separation was likewise more complete; insomuch, that in many places the slags or cinders from which the iron had formerly been extracted were again used as fresh ore, and yielded plenty of metal.

But though this method was found to be preferable to the others, yet great improvements were still wanted. In order to melt very large quantities of ore at a time, it was necessary to use bellows of an immense size; and in proportion to their size they stood in need of the more frequent and expensive repairs. The oil also, which the bellows required in large quantity, becoming rancid, was found to generate a kind of inflammable vapour, which sometimes burst the bellows with explosion, and thus rendered them totally useless. A new method, therefore, of blowing up fires, altogether free from the abovementioned inconveniences, was fallen upon by means of water. It depends on the following principle, viz. That a stream of water, running through a pipe, if by any means it is mixed with air at its entrance into the pipe, will carry that air along with it, and part with it again as soon as it comes out of the pipe; and if the air is then collected by a proper apparatus, it may with success be used for exciting the most violent degrees of heat.

Thus, with very little expence, where there is a sufficient quantity of water, as strong a blast of air as can be desired may be readily obtained; for several machines may be constructed, and joined together in a manner somewhat similar to that above-mentioned, until all the quantity of water is employed. It is proper to observe, however, that as by this method the air is loaded with moisture, it is proper to make the condensing vessel as high as conveniently may be, that the air may arrive at the furnace in as dry a state as possible. The long slender pipes in the left-hand machines represent a gage filled with mercury or water, by which the strength of the blast may be determined.

In the large iron founderies another method is used for blowing up the fires by means of a kind of air-pumps. These consist of cast-iron cylinders of about three feet diameter, exactly fitted with a piston moved up and down by means of a water-wheel. In the bottom of the cylinder is a large valve like that of a bellows, which rises as the piston is lifted up, and thus admits the air into the cavity of the cylinder from below. Immediately above the bottom is a tube which goes to the furnace; and as it proceeds from the cylinder is furnished with a valve opening outward. Thus, when the piston is drawn up, the valve in the bottom rises and admits the air that way into the cylinder; while the lateral valve shuts, and prevents any air from getting into it through the pipe. When the piston is thrust down, the valve in the bottom shuts, while the air being compressed in the cavity of the cylinder is violently forced out through the lateral tube into the furnace. In the great foundery at Carron, four of these large cylinders were a few years ago employed at their principal furnace, and so contrived that the strokes of the pistons, being made alternately, produced an almost uninterrupted blast. Some little intermission might indeed be perceived by the air, but it was too trifling to produce any sensible effect on the heat of the furnace. Even this could have been prevented by means of a large reservoir into which all the four cylinders might discharge their blast. This should be furnished with a heavy piston; whose weight, being supported by the air of the cylinder alone, would force it out through its lateral tube in a manner perfectly equable, without any of that puffing or interruption in the blast, perceptible though but in a small degree in the other.

To FU'RNACE. *v. a.* To throw out as sparks from a furnace: not used (*Shakspeare*).

FURNES, a town of Flanders, seated near the German Ocean, on the canal from Bruges to Dunkirk. Lat. 51. 4 N. Lon. 2. 45 E.

To FU'RNISH. *v. a.* (*fournir*, French.) 1. To supply with what is necessary (*Knolles*).

2. To give; to supply (*Addison*). 3. To fit up; to fit with appendages (*Bacon*). 4. To equip; to fit out for any undertaking (*Watts*). 5. To decorate; to supply with ornamental household stuff (*Halifax*).

FU'RNISHER. *s.* (*fournisseur*, French.) One who supplies or fits out.

FU'RNITURE. *s.* (*fourniture*, French.) 1. Moveables; goods put in a house for use or ornament (*South*). 2. Appendages (*Tillotson*). 3. Equipage; embellishments; decorations—in this sense the word is chiefly applied to the extra lines and curves drawn upon a dial; as the ecliptic, parallels of declination, &c.

FUROR UTERINUS. (*furor.*) See NYMPHOMANIA.

FURR, in commerce, signifies the skin of several wild beasts, dressed in alum with the hair on, and used as part of dress, by magistrates and others. The kinds mostly made use of are those of the ermine, sable, castor, hare, rabbit, &c. It was not till the later ages that the furrs of beasts became an article of luxury. The more refined nations of ancient times never used them; those alone who were stigmatised as barbarians were clothed in the skins of animals. During captain Cook's last voyage to the Pacific Ocean, besides various advantages derived from it as enlarging the boundaries of science, a new source of wealth was laid open in the exchange of European commodities for furrs of the most valuable and important kind on the north-west of America. Previously to this, a similar trade had been carried on, though on a much narrower scale, in Canada. It was begun by the French almost two centuries back, and in time Montreal was the grand mart of this species of commerce. The number of Indians who resorted thither increased as the name of the Europeans was more known. Whenever the natives returned with a new supply of furrs, they usually brought with them a new and more distant tribe; thus a kind of market or fair was opened, to which the several Indian nations of the new continent resorted. Our own countrymen were not long easy without sharing in this trade, and the colony at New York soon found means to divert the stream of this great circulation. The Hudson's bay trade, carried on by a company designated as the Hudson's Bay Company, was at one time almost the only trade in this article from Great Britain; there have, however, been other persons of late years engaged in it. About twenty years ago a commercial establishment of this kind was formed under the title of the North-West Company. It was an association of about twenty persons, agreeing among themselves to carry on the furr trade. Their capital was divided into twenty shares; of these a certain proportion was held by the people who managed the business in Canada, who were stiled agents, and paid as such independently of the profits of the trade. The articles manufactured here that are used in this traffic, are coarse woollen cloths of different kinds, blankets, arms and ammunition, Manchester goods, all kinds of the coarser hardware, cotton, hats, and stockings.

FURRS, in heraldry, a bearing which represents the skins of certain beasts, used as well in the doublings of the mantles belonging to the coat-armours, as in the coat-armour themselves.

FU'RRIER. *s.* (from *fur.*) A dealer in furs.

FU'RROW. *s.* (ꝼuꞃh, Saxon.) 1. A small trench made by the plough for the reception of seed (*Dryden*). 2. Any long trench or hollow (*Dryden*).

FU'RROW-WEED. *s.* A weed that grows in furrowed land (*Shakspeare*).

To FU'RROW. *v. a.* (from the noun.) To cut in furrows (*Milton*). 2. To divide in long hollows (*Suckling*). 3. To make by cutting (*Wotton*).

FU'RROWED, in botany, fluted or grooved stem. Caulis sulcatus. Marked with deep broad channels longitudinally. Applied sometimes to the leaf.

FURRUCKABAD, a district of Hindustan Proper, contiguous to the W. bank of the Ganges, and surrounded by Oude. The chief town is of the same name. Lat. 27. 28 N. Lon. 79. 30 W.

FU'RRY. *a.* (from *fur.*) 1. Covered with fur; dressed in fur (*Felton*). 2. Consisting of fur (*Dryden*).

FURSTENFIELD, a town of Lower Stiria, in Germany, 50 miles S. of Vienna. Lat. 47. 23 N. Lon. 16. 5 E.

FURSTENWALD, a town of the middle Marche of Brandenburg, in Germany. It is 20 miles W. of Frankfort. Lat. 52. 23 N. Lon. 14. 8 E.

FU'RTHER. *a.* (from *forth*; *forth, further, furthest.* See FORTH and FARTHER.) 1. At a great distance. 2. Beyond this (*Matthew*). 3. *Further* has the force of a substantive in the phrase *no further*, for *nothing further.*

FU'RTHER. *ad.* (from *forth.*) To a greater distance (*Numbers*).

To FU'RTHER. *v. a.* (ꝼoꞃðꞃian, Saxon.) To put onward; to forward; to promote; to countenance; to assist; to help (*Hooker*).

FU'RTHERANCE. *s.* (from *further.*) Promotion; advancement; help (*Tillotson*).

FU'RTHERER. *s.* (from *further.*) Promoter; advancer (*Ascham*).

FU'RTHERMORE. *ad.* (*further* and *more.*) Moreover; besides (*Shakspeare*).

FU'RTIVE. *a.* (*furtive*, French.) Stolen; gotten by theft (*Prior*).

FU'RUNCLE. (*furunculis*, from *furo*, to rage; so named from its heat and inflammation before it suppurates.) A boil. An inflammation of a subcutaneous gland, known by an inflammatory tumour that does not exceed the size of a pigeon's egg.

FU'RY. *s.* (*furor*, Latin.) 1. Madness. 2. Rage; passion of anger; tumult of mind approaching to madness (*Shakspeare*). 3. Enthusiasm; exaltation of fancy (*Dryden*). 4. A stormy, turbulent, raging woman (*Addison*).

FURZE. *s.* (fyrs, Saxon.) Gorse; goss. See ULEX.

FU'RZY. *a.* (from *furze.*) Overgrown with furze; full of gorse (*Gay*).

FUSA, in the Italian music, a quaver.

FUSA'NUS, in botany, a genus of the class polygamia monœcia. Herm.: calyx five-cleft; corolless; stamens four; germ inferior; stigmas four; drupe. One species only; a Cape tree, with two-edged branches and axillary racemes.

FUSCA'TION. *s.* (*fuscus*, Latin.) The act of darkening or obscuring.

FUSE, or FUZE, in artillery. See FUSEE.

To FUSE. *v. a.* (*fusum*, Latin.) To melt; to put into fusion; to liquify by heat.

To FUSE. *v. n.* To be melted.

FU'SEE. *s.* (*fuseau*, French.) In clock-work, is the conoidal part which is drawn by the spring, and about which the chain or string is wound. See CLOCK and WATCH.

FUSEE, or FIRELOCK. See MUSQUET.

FUSEE, or FUSE, of a bomb or grenado, is that which communicates fire to the whole powder or composition in the shell, to do the designed execution.

Fuses are chiefly made of very dry beech wood, and sometimes of horn-beam taken near the root. They are turned rough and bored at first, and then kept for several years in a dry place. The diameter of the hole is about ⅖ of an inch; the hole does not go quite through, having about ¼ of an inch at the bottom; and the head is made hollow in the form of a bowl.

The composition for fuses is, salt-petre 3, sulphur 1, and mealed powder 3 or 4, and sometimes 5. This composition is driven in with an iron driver whose ends are capped with copper, to prevent the composition from taking fire, and to keep it equally hard; the last shovel-full being all mealed powder, and 2 strands of quick match laid across each other, being driven in with it, the ends of which are folded up into the hollow top, and a cap of parchment tied over it until it is used.

FU'SIBLE. *a.* (from *fuse.*) Capable of being melted, or made liquid by heat (*Boyle*).

FU'SIBILITY. *s.* (from *fusible.*) Capacity of being melted; quality of growing liquid by heat (*Wotton*).

FUSIFORM ROOT. (*fusus*, a spindle.) In botany, spindle-shaped root. Simple or generally so, tapering downwards to a point; as in radish, carrot, parsnip. Applied also to the leaf, as in crassula rubens.

FU'SIL. *a.* (*fusile*, French.) 1. Capable of being melted; liquifiable by heat (*Milton*). 2. Running by the force of heat (*Philips*).

FU'SIL. *s.* (*fusil*, French.) 1. A firelock; a small neat musket. 2. (In heraldry; from *fusus*, Latin.) Something like a spindle (*Peacham*).

FUSILI'ER. *s.* (from *fusil.*) A soldier armed with a fusil; a musketeer.

FU'SION. *s.* (*fusio*, Latin.) 1. The act of melting. 2. The state of being melted (*Newton*).

FU'SION. A chemical process, by which bodies are made to pass from the solid to the fluid state, in consequence of the application of heat. The chief objects susceptible of this operation are salts, sulphur, and metals. Salts are liable to two kinds of fusion; the one which is peculiar to saline matters, is owing to water, and is called aqueous fusion; the other which arises from the application of fire, is known by the name of igneous fusion.

FUSS. *s.* (a low cant word.) A tumult; a bustle (*Swift*).

FUST. *s.* (*fuste*, French.) 1. The trunk or body of a column. 2. A strong smell, as that of a mouldy barrel.

To FUST. *v. n.* To grow mouldy; to smell ill.

FUST, or FAUST (John), a goldsmith of Mentz, and one of the three to whom the invention of printing has been ascribed. It appears, however, that he only supported Guttemburg in his attempts to make moveable metal types at Strasburg. This was in 1444. Fust is supposed to have died of the plague at Paris about 1466. The story told of his being accused of magic on account of the exactness of his bibles at Paris is a fable.

FU'STIAN. *s.* (*futaine*, French.) 1. A kind of cloth made of linen and cotton, or of cotton only (*Shakspeare*). 2. A high swelling kind of writing made up of heterogeneous parts; bombast (*Smith*).

FU'STIAN. *a.* (from the noun.) 1. Made of fustian. 2. Swelling; unnaturally pompous; ridiculously tumid (*Dryden*).

FUSTIC, a kind of wood used in dying. See MORUS.

FU'STIGATE. *v. a.* (*fustigo*, Latin.) To beat with a stick; to cane.

FUSTIGATIO, in the Roman customs, a punishment inflicted by beating with a cudgel: it was peculiar to freemen; for the slaves were scourged or lashed with whips.

FUSTILA'RIAN. *s.* A low fellow; a stinkard; a scoundrel: not used (*Shakspeare*).

FU'STINESS. *s.* (from *fusty.*) Mouldiness; stink.

FU'STY. *a.* (from *fust.*) Ill smelling; mouldy.

FU'TILE. *a.* (*futile*, French.) 1. Talkative; loquacious (*Bacon*). 2. Trifling; worthless; of no weight.

FUTI'LITY. *s.* (*futilité*, French.) 1. Talkativeness; loquacity (*L'Estrange*). 2. Triflingness: want of weight; want of solidity (*Bentley*).

FU'TTOCKS. *s.* (from *foot hooks. Skinner*). The lower timbers that hold the ship together.

FUTTYPOUR, SICRI, a considerable town of Hindustan Proper, in the province of Agra. It is seated under a range of hills, the southern boundary of an immense plain, in which, for the greatest part, not a shrub is to be seen, and the soil is almost as fine as hair powder; a circumstance productive of the most disagreeable effects. Lat. 27° N. Lon. 77. 45 E.

FU'TURE. *a.* (*futurus*, Latin.) That will

be hereafter; to come: as, the *future* state (*Milton*).

FUTURE TENSE, among grammarians. See GRAMMAR and TENSE.

FU'TURE. *s.* Time to come; somewhat to happen hereafter (*Locke*).

FU'TURELY. *ad.* In time to come (*Ral.*).

FUTURI'TION. *s.* The state of being to be; the condition of being come to pass hereafter (*South*).

FUTU'RITY. *s.* (from *future.*) 1. Time to come (*Swift*). 2. Event to come. 3. Futurition (*Glanville*).

FUZEE. See FUSEE.

FUZEE. A name given by farriers to two considerable splints in a horse, joining from above downwards Commonly a fuzee rises to the knee, and lames the horse. Fuzees differ from screws or thorough splints in this, that the latter are placed on the opposite sides of the leg. A fuzee is accounted, moreover, more dangerous than a simple splint.

To FUZZ. *v. n.* To fly out in small particles.

FU'ZZBALL. *s.* A kind of fungus, which, when pressed, bursts and scatters dust in the eyes.

FY. *interj.* (*fy*, French; φεῦ, Greek.) A word of blame and disapprobation (*Spenser*).

FYAL, one of the Azores, or Western islands. It is well cultivated; and has abundance of chesnuts, beeches, myrtles, and aspen-trees. The cottages of the common people are built of clay, thatched with straw; and are small, but cleanly and cool. The most considerable place is called Villa de Horta. Lon. 28. 36 W. Lat. 38. 32 N.

FYZABAD, a city of Hindustan Proper, in the territory of Oude. This city is very populous. Lat. 26. 34 N. Lon. 82. 30 E.

G

G, THE seventh letter and fifth consonant of our alphabet; though, in the alphabets of all the oriental languages, the Hebrew, Phœnician, Chaldee, Syriac, Samaritan, Arabic, and even Greek, G is the third letter. The Hebrews call it *ghimel* or *gimel*, *q. d.* camel; because it resembles the neck of that animal; and the same appellation it bears in the Samaritan, Phœnician, and Chaldee: in the Syriac it is called *gamel*, in Arabic *giim*, and in Greek *gamma*.

From the Greeks the Latins borrowed their form of this letter; the Latin G being certainly a corruption of the Greek gamma Γ, as might easily be shown, had our printers all the characters and forms of this letter which we meet with in the Greek and Latin MSS. through which the letter passed from Γ to G. Diomed, lib. ii. cap. De litera, calls G a new letter. His reason is, that the Romans had not introduced it before the first Punic war; as appears from the rostral column erected by C. Duilius, on which we every where find a C in lieu of G. It was Sp. Carvilius who first distinguished between those two letters, and invented the figure of the G.; as we are assured by Terentius Scaurus. The C served very well for G; it being the third letter of the Latin alphabet, as the Γ or γ was of the Greek.

Ainsworth remarks, that the Romans, when they wrote *pucna* and *Carthaco*, read *pugna* and *Carthago*; and to remedy the ambiguity and inconvenience this led to, they took in the letter G, which they had not, to make their tongue more easy; whereas we have laid aside þ and ȝ which we had, to make ours more difficult, which is very unaccountable.

It has been much controverted whether the Romans pronounced the G before the N, as the French do in these words, *Agnez*, *Magnifique*, *Espagnol*, &c.

But in all probability the Romans pronounced the G not as the French do in the above words, and the G in *Agnus* was pronounced by them, as it is in *Agger*; for the other pronunciation is so particular and different from the common pronunciation of G, the ancient writers had otherwise never made use of it.

And it is to be observed, that the G is so little pronounced in these words *Agnez* and the like, that it does but denote a liquid N; as the same letter G shews in the Italian tongue the liquid L, *figlliula*, daughter: wherefore the Spaniards write *Segnor* without a G, drawing only a little stroke upon the N, to shew that it is a liquid letter; and that it receives that pronunciation, writing thus, *Señor*, and pronouncing *Segnor*. And Ramus in his French grammar marks this liquid N in French only with a little comma over it, instead of joining the G to it.

Here arises still another difficulty, namely, to know if the letter N is changed by the Greeks into Γ in some words, as Ἄγγελος and ἄγκυρα, &c. Γ is then pronounced like an N. For it seems, says Henricus Stephanus, that it is an error of the copyists, who have made the ν a little too broad in joining the small letters, and have made a γ of it. From whence comes that in the MS. written in capital letters, like those he has made use of to make his Thesaurus, these whole words are found with an N, ΑΝΓΕΛΟΣ, ΑΝΚΥΡΑ, and the like. For, says he, it seems absurd to say, that N was changed into Γ, to the end that Γ might be pronounced like an N. Wherefore Scaliger tells us, that if we read sometimes these words with an N, then we must be sure that it is a fault of the copyists, who thought to express this pronunciation the better by that character; which pronunciation, as Vossius says, should require rather some new and particular character

The Latins had something like that in their tongue, which Nigidius in Aulus Gallius calls a false N, as in the words *Anguis*, *Ancora* and others. Wherefore Varro, as is related by Priscian, affirms that Attius and the ancient authors wrote these words with a double GG, like the Greeks, Aggulus, Aggens, and the like.

The letter G is of the mute kind, and cannot be any way sounded without the help of a vowel. It is formed by the reflexion of the air against the palate, made by the tongue as the air passes out of the throat; which Martianus Copello expresses thus, G *spiritus cum palato*; so that G is a palatal letter.

The modern G takes its form from that of the Latins. In English it has two sounds, one from the Greek Γ, and the Latin, which is called that of the hard G, because it is formed by a pressure somewhat hard on the fore-part of the tongue against the upper gum; which sound it retains before *a*, *o*, *u*, *l*, *r*; as *gate*, *go*, *gull*. At the end of a word it is always hard, as *ring*, *sing*, &c. The other sound, called that of the soft G, resembles that of *j*; and is commonly found before *e* and *i*, as in *gesture*, *giant*, &c. To this rule, however, there are many exceptions; G is often hard before *i*, as *give*, &c. and sometimes before *e*, as *get*, &c. It is also hard in derivatives from words ending in *g*, as *singing*, *stronger*, &c. and generally before *er*, at the end of words, as *finger*. G is

mute before *n*, as *gnash*, *sign*. *Gh* has the sound of the hard G in the beginning of a word, as *ghostly*; in the middle, and sometimes at the end, it is quite silent, as *right*, *though*. At the end of a word, *Gh* has often the sound of *f*, as *laugh*, *rough*, *tough*.

As a *numeral*, G was anciently used to denote 400; and with a dash over it thus $\overline{G}$, 40,000.

As an *abbreviature*, G stands for *Gaius*, *Gellius*, *gens*, *genius*, &c. G. G. for *gemina*, *gessit*, *gesserunt*, &c. G. C. for *genio civitatis* or *Cæsaris*. G. L. for *Gaius libertus*, or *genio loci*. G. V. S. for *genio urbis sacrum*. G. B. for *genio bono*. And G. T. for *genio tutelari*.

In *music*, G is the character or mark of the treble cleff; and from its being placed at the head, or marking the first sound in Guido's scale, the whole scale took the name *gamut*.

GABARA, or GABBARA, in antiquity, the dead bodies which the Egyptians embalmed, and kept in their houses.

• GA'BARDINE. *s.* (*gavardina*, Italian.) A coarse frock; any mean dress (*Shak.*).

GABBIANI (Antonio Domenico), an historical and portrait painter of Florence, born in 1652, and died in 1726. He was patronized by the grand duke Cosmo III. who sent him to the Florentine academy, at Rome, where he studied three years, and on his return to his native city was employed by his highness and the principal nobility of his court. He was killed by a fall from a scaffold as he was at work.

To GA'BBLE. *v. n.* (*gabbare*, Italian.) 1. To make an inarticulate noise (*Dryden*). 2. To prate loudly without meaning (*Hudibras*).

GA'BBLE. *s.* (from the verb.) 1. Inarticulate noise, like that of brute animals (*Shakspeare*). 2. Loud talking without meaning (*Milton*).

GA'BBLER. *s.* (from *gabble.*) A prater; a chattering fellow

GABEL, GABELLA, GABLUM, GABLAGIUM, in French *gabelle*, i.e. *vectigal*, hath the same signification among the ancient English writers that gabelle till lately had in France. It is a tax; but hath been variously used, as for a rent, custom, service, &c. And where it was a payment of rent, those who paid it were termed gablatores. When the word gabel was formerly mentioned without any addition to it, it signified the tax on salt, though afterwards it was applied to all other taxes.

GABIANUM OLEUM. See PETROLEUM RUBRUM.

GABIN, a town of Poland, in the palatiate of Rava. Lat. 52. 26 N. Lon. 19. 5 E.

GABINIAN LAWS, in Roman antiquity, laws instituted upon several occasions, by persons of the name of Gabinius. The first was the Gabinia lex de Comitiis, by A. Gabinius the tribune, in the year of Rome 614: it required, that in the public assemblies for electing magistrates, the votes should be given by tablets, and not viva voce.

GABIONS, in fortification, baskets made of ozier twigs, of a cylindrical form, six feet high, and four wide: which being filled with earth, serve as a shelter from the enemy's fire. See FORTIFICATION.

GA'BLE. *s.* (*gaval*, Welsh.) The sloping roof of a building (*Mortimer*).

GABLE-END OF A HOUSE, is the upright triangular end from the cornice or eaves to the top of the house.

GABRES, or GAVRES, a religious sect in Persia and India, called also *Gebres*, *Guebres*, *Gevres*, *Gaurs*, &c.. (See MAGI.) The Turks call the Christians *Gabres*, q. d. infidels, or people of a false religion; or rather, as Leunclavius observes, heathens or gentiles: the word *Gabre* among the Turks having the same signification as *pagan* or *infidel* among the Christians, and denoting any thing not Mahometan. In Persia the word has a more peculiar signification; wherein it is applied to a sect dispersed through the country, and said to be the remains of the ancient Persians or followers of Zoroaster, being worshippers of fire. They have a suburb at Ispahan, which is called *Gaurabad*, or the town of the *Gaurs*, where they are employed in the meanest and vilest drudgery: some of them are dispersed through other parts of Persia; but they principally abound in Kerman, the most barren province in the whole country, where the Mahometans allow them liberty and the exercise of their religion. Several of them fled many ages ago into India, and settled about Surat, where their posterity remain to this day. There is also a colony of them at Bombay. They are a poor, ignorant, inoffensive people, extremely superstitious and zealous for their rites, rigorous in their morals, and honest in their dealings.

GABRIEL (*a man of God, strength of God*), one of the principal angels in heaven; who was sent to the prophet Daniel (*Dan.* viii. 16. ix. 21.); who announced the birth of John the baptist (*Luke* i. 11), and of Jesus Christ (*Luke* i. 36.).

GAD. *s.* (ᵹaꝺ, Saxon.) 1. A wedge or ingot of steel (*Moxon*). 2. A style or graver (*Shakspeare*).

To GAD. *v. n.* (*gadaw*, Welsh, to forsake.) To ramble about without any settled purpose; to rove loosely and idly (*Fairfax*).

GA'DDER. *s.* (from *gad.*) A rambler; one that runs much abroad without business (*Eccles.*).

GA'DDINGLY. *ad.* (from *gad.*) In a rambling manner.

GAD-FLY, in entomology. See ŒSTRUS.

GADUS. Cod-fish. In zoology, a genus of the class pisces, order jugulares. Head smooth; gill-membrane with seven slender rays; body oblong, covered with deciduous scales; fins all covered with the common skin; dorsal and anal generally more than one; the rays unarmed; ventral fins slender, ending in a point. Twenty-three species. Chiefly inhabitants of the European seas, and especially towards the

north; a few of the seas of America, and one or two of the Pacific ocean. They may be thus subdivided.

A Dorsal fins three; mouth bearded.

B Dorsal fins three; mouth beardless, or without cirri.

C Dorsal fins two.

D Dorsal fin one.

The following are the most remarkable of this genus.

1. G. æglesinus. Haddock. Whitish; tail forked, upper jaws longer; eyes large, pupil black, iris silvery; scales minute, rounded, and striking firmer than in the other species; very minute teeth in the jaws. Inhabits the northern seas, and migrates in vast shoals, that appear on the Yorkshire coast about Christmas; feeds in summer on young herrings and other small fishes; in winter chiefly on serpulæ; is eagerly hunted after by seals and other rapacious marine animals; flesh white and tolerably good.

2. G. callarius. Zorsk. Colour various; equal; upper jaw longer; head less than the last, cinereous, spotted in the summer with brown, in the winter with black. Inhabits the Baltic and Northern European seas in general; sometimes enters the mouths of rivers; feeds on smaller fishes, worms, and marine insects; flesh white, firm, and finely flavoured; seldom exceeds two pounds in weight.

3. G. morpua. Common cod. Tail subequal; first anal ray spinous; mouth large, jaws equal, bearded with a cirrous body, cinereous, spotted with yellowish, beneath white; the younger fishes sometimes reddish, spotted with orange; scales larger than in any other of its tribe; flesh white, and excellent when in season.

The stated migration of the common cod, which is by far the most important species of the entire genus, is a very remarkable circumstance in its history; although in this respect it only assimilates with the habits of many other species of the same tribe. All these in their annual voyages, in the immensity of their numbers, and in their social habits, bear a strong analogy to birds of passage. The cod, the haddock, and the whiting, issue forth in immense shoals from the arctic seas, very early in the spring, and after having dispersed over the temperate latitudes, again regularly return to their northern retreats about the same time of the year. The necessity of procuring food has been assigned as the cause of their annual migrations from the arctic seas; and their retreat thither has been ascribed to the security that these unfrequented tracts are supposed to afford them, while they deposit their spawn.

But although the cod undertakes annual excursions of considerable length, it still may be regarded as a local fish; for it never ventures into the warmer tracts of the ocean. None are found in the Mediterranean; and few in those parts of the Atlantic of the same latitude. They are in greatest perfection, and seem to prefer that space lying between the fiftieth and sixtieth degrees; such as are caught beyond being always inferior both in quantity a[illegible] quality. Their grand resort for centuries pa[illegible] has been on the banks of Newfoundland, a[illegible] other sand banks off Cape Breton. This e[illegible] tensive flat seems to be the broad top of a su[illegible] aqueous mountain, every where surround[illegible] with a deeper sea. Hither the cod annual[illegible] repair, in numbers beyond the power of calc[illegible] lation, to feed upon the worms that swar[illegible] upon the sandy bottom. Here they are tak[illegible] in such quantities, that they supply all Euro[illegible] with a considerable stock of provision. T[illegible] English have stages erected all along the sho[illegible] for salting and drying them; and the fisherme[illegible] who take them with the hook and line, dra[illegible] them as fast as they can throw them out.

This immense capture makes no sensib[illegible] diminution of their numbers; for after th[illegible] food is consumed in these parts, or when t[illegible] season of propagation approaches, they ta[illegible] their departure for the polar seas, where th[illegible] deposit their roes in full security, and rep[illegible] the waste which has been occasioned by deat[illegible] or the depredations of their enemies. Th[illegible] annually make their appearance on the coa[illegible] of Iceland, Norway, and Britain, gradua[illegible] diminishing in their numbers, as they proce[illegible] to the south, and ceasing altogether on this si[illegible] the straits of Gibraltar.

Before the discovery of Newfoundland, t[illegible] largest cod-fisheries were on the coasts of Ic[illegible] land, and the Hebrides, where the English [illegible] sorted in quest of them as early as the beginni[illegible] of the fifteenth century. On the banks [illegible] Newfoundland the English, who for a con[illegible] derable period of time, and especially in t[illegible] middle of the sixteenth century, were on[illegible] rivals of the French, Spaniards, and Port[illegible] guese, have long possessed almost a monop[illegible] of the trade, and draw from it not merely [illegible] valuable accession to the wealth of individua[illegible] but a very considerable augmentation of t[illegible] naval power of the empire.

This immense fishery is conducted in a tra[illegible] of the sea agitated by a perpetual swell, a[illegible] involved in continual fogs and darkness. T[illegible] bait used is herring, a small fish called capeli[illegible] a shell fish, and bits of sea fowl. The natu[illegible] food of the cod is small fishes, testaceous an[illegible] mals, such as crabs and whelks; and the[illegible] digestive powers are so strong, that they di[illegible] solve every substance, which, from an insatiab[illegible] voracity, they swallow. Their sight is pr[illegible] bably very imperfect; for almost every sma[illegible] body that is agitated by the water attracts the[illegible] rapacious jaw, stones and pebbles not e[illegible] cepted, for these are often found in the[illegible] stomachs.

The sounds of the cod-fish are reckoned [illegible] great delicacy, and frequently brought fro[illegible] Newfoundland, salted up by themselves: the[illegible] are employed by the fishermen of Iceland [illegible] making isinglass; and are obtained by car[illegible] fully separating them from the back-bone, [illegible] which they adhere after the fish is cut up.

The general weight of the cod-fish on

British coasts is from fourteen to forty pounds; some have indeed been caught near eighty, but those of the middle size are most esteemed for the table. Their time of spawning is from January to April, when the females deposit their ovules in rough, rocky ground. After having been exonerated of a load containing three millions of young, the parent recovers its plumpness sooner than almost any other fish; and is caught in good condition, during almost the whole summer.

4. G. Fuscus. Bib. First ray of the ventral fins setaceous: body above pale olive, sides finely tinged with gold; belly white; scales larger than the last, and extremely deciduous: flesh excellent. Inhabits European seas; grows to a foot long.

5. G. Barbalus. Whiting-pout. Each side the lower jaw seven punctures: body white, more dusky on the back, and tinged with yellow. Inhabits the northern European seas: from fifteen to eighteen inches long: deposits its spawn among rock, on a southerly shore; feeds on smaller fishes and crabs.

6. G. Minutus. Poor. On each side the lower jaw nine punctures; vent in the middle of the body: body silvery, spotted with black; back brownish-yellow, covered with small thin scales. Inhabits European and Mediterranean seas: seven inches long; feeds on testaceous animals and worms, and is the prey of the larger fishes of its own tribe.

7. G. Merlangus. Whiting. Back dusky, rest of the body white: upper jaw longer; tail even: body long, rounded, covered with small, round, tender, silvery scales. Inhabits the European seas; appears on our own coasts in vast shoals in the spring; generally about a foot long; and esteemed by many epicures the most delicate of all its tribe.

8. G. Carbonarius. Coal-fish. Lower jaw longer; lateral line straight. Inhabits the European and Pacific seas; grows to two and a half feet long; appears about the beginning of July in large shoals about the Yorkshire coast; varies much in colour, but grows blacker with its age. See Nat. Hist. Pl. CXXVI.

9. G. Pollachius. Pullack. Lower jaw longer; lateral line curved: body above dusky-brown, gradually whitening towards the belly, beneath spotted with brown. Inhabits the rocky coasts of Europe; usually about eighteen inches long; migrates in great shoals; feeds on smaller fishes; and often frolicks near the surface of the water.

10. G. Merluccius. Hake. Mouth with cirrus; lower jaw longer: body long, covered with small scales, whitish, above hoary; flesh white, flaky, but not much esteemed. Inhabits the Northern and Mediterranean seas: from one and a half to two feet long; is extremely voracious; and migrates in vast shoals.

11. G. Molva. Ling. Mouth bearded; upper jaw longer: body very narrow and long, above brown, beneath whitish, and yellowish at the sides. Inhabits the northern seas: grows to seven feet long; feeds on fishes and crabs, approaches the shores about June to deposit its spawn: is in perfection from February to May.

GADWELL, in ornithology. See ANAS.

GAELEN (Alexander van), a Dutch painter, born in 1670, and died in 1728. He came to London, and was employed by a nobleman to paint three pieces, representing engagements between Charles I. and Oliver Cromwell, and a large one of the battle of the Boyne, in which subjects he excelled.

GAELIC LANGUAGE. See HIGHLANDS.

GÆRTNERA. In botany, a genus of the class decandria, order monogynia. Calyx five-parted; petals five, unequal, fringed; filaments slightly united at the base; one of them much longer than the rest; capsules from one to three, with four unequal wings. An East Indian shrub, described by Gærtner himself, under the name of hiptage madablota: by Sonnerat called madablota banisteria.

GAFF. *s.* A harpoon or large hook (*Ainsworth*).

GA'FFER. *s.* (ȝeꝼeꝛe, companion, Saxon.) A word of respect, now obsolete, or applied only in contempt to a mean person (*Gay*).

GAFFARELL (James), a French writer, was born at Mannes, in Provence, about 1601, and educated at the university of Apt in the same country. He zealously adopted the mysterious doctrines of the Cabala, in defence of which he wrote a quarto volume in Latin at the age of twenty-two. He was appointed librarian to cardinal Richelieu; and sent by him into Italy to collect books. He is said to have been employed by the same cardinal in a project to reconcile the protestants to the Roman catholic religion. He survived his patron many years; and died at Sigonce, at the age of 80. He was abbot of Sigonce; dean of canon law in the university of Paris; prior of le Revest de Brousse; and commandant of St. Omeil. He was the author of several works; the most celebrated of which is, Unheard-of Curiosities, concerning the Talismanic Sculpture of the Persians; the Horoscope of the Patriarchs; and the Reading of the Stars.

GA'FFLES. *s.* (ȝaꝼelucaꝛ, spears, Saxon.) 1. Artificial spurs put upon cocks. 2. A steel lever to bend crossbows (*Ainsworth*).

To GAG. *v. n.* (from *gaghal*, Dutch.) To stop the mouth with something that may allow to breathe, but hinder to speak (*Pope*).

GAG. *s.* (from the verb.) Something put into the mouth to hinder speech or eating (*Dryden*).

GAGAS, or GAGAT. See BITUMEN.

GAGE. *s.* (*gage*, French.) 1. A pledge; a pawn; a caution (*Southern*). 2. A measure; a rule of measuring (*Young*).

To GAGE. *v. a.* (*gager*, French.) 1. To wager; to depone as a wager; to impawn; to give as a caution (*Knolles*). 2. To bind by some caution or surety; to engage (*Shakspeare*). 3. To measure; to take the contents

of any vessel. More properly gauge (*Shakspeare*).

GAGE, in our ancient customs, signifies a pledge or pawn, given by way of security. The word is only properly used in speaking of moveables; for immoveables, hypotheca is used. If the gage perish, the person who received it is not to answer for it, but only for extreme negligence, &c.

GAGE is also used for a challenge to combat. See CARTEL. In that sense, it was a pledge which the accuser or challenger cast on the ground, and the other took up as accepting the challenge: it was usually a glove, gauntlet, chaperoon, or the like. See COMBAT and DUEL.

GAGE is only now retained as a substantive. As a verb, the *g* is changed into *w*, and of *gage* is formed *wage*: as, to wage law, to wage deliverance, *q. d.* to give security that a thing shall be delivered. See WAGE. If a person who has distrained be sued for not having delivered what he had taken by distress, he should wage, or gage, or gager deliverance; that is, put in surety, that he will deliver them.

GAGE (Mort), is that which is left in the hands of the proprietor, so that he reaps the fruits thereof: in opposition to the vif-gage, where the fruits or revenues are reaped by the creditor, and reckoned on the foot of the debt, which diminishes in proportion thereto. The second acquits or discharges itself; the first does not.

GAGE, in the sea language. When one ship is to windward of another, she is said to have the weather-gage of her. They likewise call the number of feet that a vessel sinks in the water, the ship's gage: this they find by driving a nail into a pike near the end, and putting it down beside the rudder till the nail catch hold under it; then as many feet as the pike is under water is the ship's gage.

GAGE, among letter-founders, a piece of box or other hard wood, variously notched, the use of which is to adjust the dimensions, slopes, &c. of the different sorts of letters. See FOUNDERY.

GAGE, in joinery, is an instrument made to strike a line truly parallel to the straight side of any board or piece of stuff. Its chief use is for gaging of tenons true, to fit into mortises; and for gaging stuff of an equal thickness. It is made of an oval piece of wood, fitted upon a square stick, to slide up and down stiffly thereon, and with a tooth at the end of a staff to score, to strike a line upon the stuff at any distance, according to the distance of the oval from it.

GAGE (Sliding), a tool used by mathematical instrument-makers for measuring and setting off distances.

GAGE (Pear). See AIR PUMP.

GAGE (Sea), an instrument invented by Dr. Hales and Dr. Desaguliers, for finding the depth of the sea, the description of which is this. AB, (Plate 68, fig. 14,) is the gage-bottle, in which is cemented the gage-tube E*f*, in the brass-cap at G. The upper end of the tube E, is hermetically sealed, and the open lower end *f*, is immersed in mercury, marked C, on which swims a small thickness or surface of treacle. On the top of the bottle is screwed a tube of brass HG, pierced with several holes, to admit the water into the bottle AB. The body K, is a weight, hanging by its shank L, in a socket N, with a notch on one side at *m*, in which is fixed the catch *l* of the spring *s*, and passing through the hole L, in the shank of the weight K, prevents its falling out, when once hung on. On the top, in the upper part of the brass-tube at H, is fixed a large empty ball, or full-blown bladder I, which must not be so large, but that the weight K may be able to sink the whole under water.

The instrument, thus constructed, is used in the following manner. The weight K being hung on; the gage is let fall into deep water, and sinks to the bottom; the socket N, is somewhat longer than the shank L, and therefore, after the weight K comes to the bottom, the gage will continue to descend, till the lower part of the socket strikes against the weight; this gives liberty to the catch to fly off the hole L, and let go the weight K; when this is done, the ball or bladder I, instantly buoys up the gage to the top of the water. While the gage is under water, the water having free access to the treacle and mercury in the bottle, will by its pressure force it up into the tube E*f*, and the height to which it has been forced by the greatest pressure, viz. that at the bottom, will be shewn by the mark in the tube which the treacle leaves behind it, and which is the only use of the treacle. This shews into what space the whole air in the tube E*f* is compressed; and consequently the height or depth of the water, which by its weight produced that compression, which is the thing required.

If the gage-tube E*f*, is of glass, a scale might be drawn on it with the point of a diamond, shewing by inspection, what height the water stands above the bottom. But the length of 10 inches is not sufficient for fathoming depths at sea, since that, when all the air in such a length of tube is compressed into half an inch, the depth of water is not more than 634 feet, which is not half a quarter of a mile.

If to remedy this, we make use of a tube 50 inches long, which for strength may be a musquet-barrel, and suppose the air compressed into an hundredth part of half an inch; then by saying as 1 : 99 :: 400 : 39600 inches, or 3300 feet; even this is but little more than half a mile, or 2640. But since it is reasonable to suppose the cavities of the sea bear some proportion to the mountainous parts of the land, some of which are more than three miles above the earth's surface, therefore, to explore such great depths, the Dr. contrived a new form for his sea-gage, or rather for the gage-tube in it, as follows: BCDF (fig. 13.) is a hollow metallic globe, communicating on the top with a long tube AB, whose capacity is a ninth part of that globe. On the lower part

at D, it has also a short tube DE, to stand in the mercury and treacle. The air contained in the compound gage-tube is compressed by the water as before; but the degree of compression, or height to which the treacle has been forced, cannot here be seen through the tube; therefore, to answer that end, a slender rod of metal or wood, with a knob on the top of the tube AB, will receive the mark of the treacle, and shew it, when taken out.

If the tube AB be 50 inches long, and of such a bore that every inch in length shall be a cubic inch of air, and the contents of the globe and tube together 500 cubic inches; then, when the air is compressed within an hundredth part of the whole, it is evident the treacle will not approach nearer than five inches of the top of the tube, which will agree to the depth of 3300 feet of water as above. Twice this depth will compress the air into half that space nearly, viz. 2½ inches, which correspond to 6600, which is a mile and a quarter. Again, half that space, or 1¼ inch, will shew double the former depth, viz. 13200 feet, or 2½ miles, which is probably very nearly the greatest depth of the sea.

GAGE (Bucket-sea), an instrument contrived by Dr. Hales, to find the different degrees of coolness and saltness of the sea, at different depths; consisting of a common household pail or bucket, with two heads to it. These heads have each a round hole in the middle, near four inches diameter, and covered with valves opening upwards; and that they might both open and shut together, there is a small iron-rod fixed to the upper part of the lower valve, and at the other end to the under part of the upper valve; so that as the bucket descends with its sinking weight into the sea, both the valves open by the force of the water, which by that means has a free passage through the bucket. But when the bucket is drawn up, then both the valves shut by the force of the water at the upper part of the bucket; so that the bucket is brought up full of the lowest sea-water to which it had descended.

When the bucket is drawn up, the mercurial thermometer, fixed in it, is examined; but great care must be taken to observe the degree at which the mercury stands, before the lower part of the thermometer is taken out of the water in the bucket, else it would be altered by the different temperature of the air.

In order to keep the bucket in a right position, there are four cords fixed to it, reaching about four feet below it, to which the sinking weight is fixed.

GAGE (Tide), an instrument used for determining the height of the tides by Mr. Bayley, in the course of a voyage towards the south pole, &c. in the Resolution and Adventure, in the years 1772, 1773, 1774, and 1775. This instrument consists of a glass tube, whose internal diameter was 7-10ths of an inch, lashed fast to a 10 foot fir rod, divided into feet, inches, and parts; the rod being fastened to a strong post fixed firm and upright in the water. At the lower end of the tube was an exceedingly small aperture, through which the water was admitted. In consequence of this construction, the surface of the water in the tube was so little affected by the agitation of the sea, that its height was not altered the 10th part of an inch when the swell of the sea was two feet; and Mr. Bayley was certain, that with this instrument he could discern a difference of the 10th of an inch in the height of the tide.

GAGE (Wind), an instrument for measuring the force of the wind upon any given surface. See ANEMOMETER.

To GA'GGLE. *v. n.* (*gagen*, Dutch.) To make a noise like a goose (*King*).

GAGUIN (Robert), a French historian, was born at Colines near Amiens, and educated at Paris, where he took the degree of LL.D. Charles VIII. and Louis XII. employed him in several embassies to England, Germany, and Italy. He was keeper of the royal library, and general of the order of the trinitarians, and died in 1501. His principal work is, De gestis Francorum, from Pharamond to the year 1500, folio, published at Lyons, in 1524.

GA'HNIA. In botany, a genus of the class hexandria, order monogynia. Calyx uncertain; glume one-valved, from two to five-flowered: corol; glume two-valved; style forked; seed one. Two species: Polynesian herbs with purple flowers.

GAIETA, an ancient town of Naples, in Italy. It is 70 miles S. W. of Rome. Lat. 41. 30 N. Lon. 13. 47 E.

GAILLAC, a town of France, in the department of Tarn; remarkable for its wines. Lat. 43. 54 N. Lon. 2. 5 E.

GA'ILY. See GAYLY.

GAIN. *s.* (*gain*, French.) 1. Profit; advantage (*Raleigh*). 2. Interest; lucrative views (*Shakspeare*). 3. Unlawful advantage (*Corinthians*). 4. Overplus in a comparative computation, any thing opposed to loss.

To GAIN. *v. a.* (*gagner*, French.) 1. To obtain as profit or advantage (*Milton*). 2. To have the overplus in comparative computation (*Burnet*). 3. To obtain; to procure (*Tillotson*). 4. To obtain increase of any thing allotted (*Daniel*). 5. To obtain whatever, good or bad (*Acts*). 6. To win against opposition (*Clarendon*). 7. To draw into any interest or party (*Philips*). 8. To reach; to attain (*Waller*).

To GAIN *over*. To draw to another party or interest (*Swift*).

To GAIN. *v. n.* 1. To grow rich; to have advantage; to be advanced in interest or happiness (*Ezekiel*). 2. To encroach; to come forward by degrees (*Dryden*). 3. To get ground; to prevail against (*Addison*). 4. To obtain influence with (*Swift*).

GAIN. *a.* (an old word.) Handy; ready.

GA'INER. *s.* (from *gain*.) One who receives profit or advantage (*Denham*).

GA'INFUL. *a.* (*gain* and *full*.) 1. Advantageous; profitable (*South*). 2. Lucrative; productive of money (*Dryden*).

GA'INFULLY. *ad.* (from *gainful*.) Profitably; advantageously.

GA'INFULNESS. *s.* Profit; advantage.

GA'INGIVING. *s.* (*'gainst* and *give.*) The same as misgiving; a giving against (*Shakspeare*).

GA'INLESS. *a.* (from *gain.*) Unprofitable; producing no advantage.

GA'INLESSNESS. *s.* (from *gainless.*) Unprofitableness (*Decay of Piety*).

GA'INLY. *ad.* (from *gain.*) Handily; readily; dexterously.

To GA'INSAY. *v. a.* (*'gainst* and *say.*) 1. To contradict; to oppose (*Milton*). 2. To deny any thing (*Shakspeare*).

GA'INSAYER. *s.* (from *gainsay.*) Opponent; adversary (*Hooker*).

GAINSBOROUGH, a town in Lincolnshire, with a market on Tuesdays. It is seated on the Trent, near the sea; is a well-built town, and has a brisk trade. Lat. 53. 28 N. Lon. 0. 36 E.

GAINSBOROUGH (Thomas), an English painter, was born at Sudbury, in 1727. He was entirely self-taught, and used to entertain hinself by drawing landscapes from nature in the woods of his native county. Here he was accustomed to pass his mornings in sketching an antiquated tree, a marshy brook, a few cattle, a shepherd and his flock, or other casual objects. From Sudbury he went to London, where he became a portrait painter, in which line he also acquired great eminence. His greatest excellence, however, was as a landscape painter, in which he united the brilliancy of Claude with the simplicity of Rysdael. This great artist was no less distinguished by his virtues than his talents: he impoverished himself to assist the needy. He died in 1788. (*Watkins*).

'GAINST. *prep.* (for *against.*)

To GA'INSTAND. *v. a.* (*'gainst* and *stand.*) To withstand; to oppose; to resist (*Sidney*).

GA'IRISH. *a.* (ȝeaꞃꞃian, to dress fine, Saxon.) 1. Gaudy; showy; splendid; fine (*Milton*). 2. Extravagantly gay; flighty (*South*).

GA'IRISHNESS. *s.* (from *gairish.*) 1. Finery; flaunting gaudiness. 2. Flighty or extravagant joy (*Taylor*).

GAIT. *s.* (*gat*, Dutch.) 1. A way; as, *gang your gait* (*Shakspeare*). 2. March; walk (*Spenser*). 3. The manner and air of walking (*Clarendon*).

GALACTITES, in the history of fossils, a substance much resembling the morochthus, or French chalk, in many respects, but different from it in colour. The ancients found it in the Nile and in some rivers of Greece, and used it in medicine as an astringent, and for defluxions and ulcers of the eyes. At present it is common in Germany, Italy, and some parts of France, and is wholly overlooked, being esteemed a worse kind of morochthus. See MOROCHTHUS.

GALACTOPHAGI, and GALACTOPOTÆ, in antiquity, persons who lived wholly on milk, without corn or the use of any other food.

GALACTOSPONDA, in antiquity, a libation made with milk.

GALACTOPHOROUS DUCTS. (*ductus galactophori*, from γαλα, milk, and φερω, to carry, because they bring the milk to the nipple.) The excretory ducts of the glands of the breasts of women, which terminate in the papilla or nipple.

GALACZ, or GALASI, a town of Bulgaria, seated near the Danube. Lat. 45. 24 N. Lon 28. 24 E.

GALAGE. *s.* A shepherd's clog (*Spenser*).

GALA'NGA. (*galanga*, perhaps its Indian name.) Galangal. The roots of this plant are used medicinally: two kinds are mentioned in the pharmacopœias, which differ only in size, both being the produce of one plant. The dried root is brought from China, in pieces from an inch to two in length, scarce half so thick, branched, full of knots and joints, with several circular rings, of a reddish brown colour on the outside, and brownish within. It has an aromatic smell, not very grateful, and an unpleasant, bitterish, hot, biting taste. It was formerly much used as a warm stomachic bitter, and generally ordered in bitter infusions. It is now, however, seldom employed.

GALANGA (Major.) See GALANGA.

GALANGA (Minor.) See GALANGA.

GALANGAL. See GALANGA and ALPINIA.

GALANGAL (English). See CYPRUS.

GALA'NTHUS. Snow-drop. In botany, a genus of the class hexandria, order monogynia. Corol superior, six-petalled; the three inner petals shorter and emarginate; stigma simple. One species only, G. nivalis, growing wild in the orchards of our own country. This species, however, affords three varieties, the common snow-drop, the half-double, and the double. The first is the earliest in flowering, then progressively the second and third. They are elegant ornaments to the borders of our gardens, and especially from their appearing as early as January, when no other flower has opened itself. They will succeed in almost every soil and situation, and abundantly propagate themselves by offsets from the roots.

GALA'RDIA. In botany, a genus of the class syngenesia, order polygamia frustranea. Receptacle chaffy, hemispherical; seeds crowned with a many-leaved chaff; calyx imbricate, many-leaved, flat; florets of the ray three-parted. Two species, natives of America.

GALATÆA and GALATHÆA, in fabulous history, a sea-nymph, daughter of Nereus and Doris. She was passionately loved by the cyclops Polyphemus, whom she treated with coldness and disdain; while Acis, a shepherd of Sicily, enjoyed her unbounded affection. The happiness of these two lovers was disturbed by the jealousy of the cyclops, who crushed his rival to pieces with a piece of a broken rock while he reposed on the bosom of Galatæa. The nymph was inconsolable for the loss of Acis; and, as she could not restore him to life, she changed him into a fountain.

GALATIA, the ancient name of a province

of Asia Minor, now called Amasia. It was bounded on the east by Cappadocia, on the west by Bithynia, on the south by Pamphylia, and on the north by the Euxine sea. It was the north part of Phrygia Magna; but, upon being occupied by the Gauls, was called Galatia; and because situated amidst Greek colonies, and itself mixed with Greeks, Gallogræcia. Strabo calls it Galatia and Gallogræcia: hence a two-fold name of the people, Galatæ and Gallogræci.

GALATIANS (Epistle to), in the Scripture canon, was written, according to some critics, in A.D. 51; according to others, about the year 52, or very beginning of 53.

The churches of Galatia were first converted to the Christian faith by St. Paul, about the latter end of the year 50. From the contents of this epistle it appears, that after he had preached the gospel to the Galatians, some judaizing zealots had endeavoured to degrade the apostle's character among them, as one not immediately commissioned by Christ like the other apostles; and to subvert his doctrine with respect to justification, by insisting on the observation of the Jewish ceremonies, and so attempting to incorporate the law with Christianity.

The principal designs, therefore, of St. Paul in this epistle, were to assert and vindicate his apostolical authority and doctrine: to shew the sincerity and consistency of his behaviour: to establish and confirm the churches of Galatia in the true faith of Christ, and to prove that the Jewish ceremonies were not necessary to justification: to expose the errors that were introduced among them by the judaizing teachers: and to revive those principles of Christianity which he had inculcated when he first preached the gospel among them.

The subject of this is much the same with that of the epistle to the Romans, and the same points of controversy are handled in them both: only the following question is more particularly examined here, viz.: "Whether circumcision and the full observation of the ceremonial law of Moses were necessary to the salvation of a Christian convert?"

The last two chapters contain some practical exhortations levelled against the animosities and great partialities which this dispute had produced and ripened among the Galatians.

GA'LAX. In botany, a genus of the class pentandria, order monogynia. Corol salver-shaped; calyx ten-leaved; capsule one-celled, two-valved, elastic. One species; a native of Virginia.

GALA'XIA. In botany, a genus of the class monadelphia, order triandria. Spathe one or two-leaved; calyxless; corol one-petal, six-cleft, with a long tube; style one; capsule three-celled, inferior. Three species; two of the Cape; one of the straits of Magellan.

GALAXY, or Milky-way, or Via lactea, in astronomy, that long, whitish, luminous track, which seems to encompass the heavens like a swath, scarf, or girdle; and which is easily seen in a clear night, especially when the moon is not up. It is of a considerable, though unequal breadth; being also in some parts double, but in others single.

The galaxy passes through many of the constellations in its circuit round the heavens, and keeps its exact place or position with respect to them.

There have been various strange and fabulous stories and opinions concerning the galaxy. The ancient poets, and even some of the philosophers, speak of it as the road or way by which the heroes went to heaven. But the Egyptians called it the Way of Straw, from the story of its rising from burning straw, thrown behind the goddess Isis in her flight from the giant Typhon. While the Greeks, who affect to derive every thing in the heavens from some of their own fables, have two origins for it: the one, that Juno, without perceiving it, accidentally gave suck to Mercury when an infant; but that as soon as she turned her eyes upon him, she threw him from her, and as the nipple was drawn from his mouth, the milk ran about for a moment: and the other, that the infant Hercules being laid by the side of Juno when asleep, on waking she gave him the breast; but soon perceiving who he was, she threw him from her, and the heavens were marked by the wasted milk.

But the moderns, and indeed some few ancients, look upon the galaxy as an assemblage of an infinite number of minute stars. Dr. Herschel, on examining the milky way, has seen the astonishing number of 116,000 stars pass through the field of view of a telescope only 15′ aperture, in the space of a quarter of an hour. How extremely applicable and beautiful then is the language of Milton, when he speaks thus:

A broad and ample road, whose dust is gold,
And pavement stars, as stars to thee appear,
Seen in the galaxy, that milky way,
Which nightly as a circling zone thou seest
Powder'd with stars.

There are other such marks in the heavens; as the nebulæ, or, nebulous stars, and certain whitish parts about the south pole, called Magellanic clouds, which are all of the same nature, appearing when viewed through a telescope, to be vast clusters of small stars which are too faint to affect the eye singly.

GALBA (Servius Sulpicius), a Roman who, by unremitted diligence, rose gradually to the greatest offices of the state. He dedicated the greatest part of his time to solitary pursuits, chiefly to avoid the suspicions of Nero. His disapprobation of the emperor's commands was the cause of new disturbances. Nero ordered him to be put to death, but he escaped the executioner, and was publicly saluted emperor. When seated on the throne, he suffered himself to be governed by favourites, who exposed the goods of the citizens to sale, to gratify their avarice. The crime of murder was blotted out, and impunity purchased with a large sum of money. Such conduct greatly displeased the

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people; and when Galba refused to pay the *soldiers the money which he had promised* them, when raised to the throne, they assassinated him in the 73d year of his age, and in the eighth month of his reign, and proclaimed Otho emperor in his room, January 16th, A. D. 69. The virtues which had shone so bright in Galba, when a private man, totally disappeared when he ascended the throne.

GALBANUM. (*galbanum*, Hebrew.) A gummi-resinous juice, obtained partly by its spontaneous exudation from the joints of the stem of the bubon galbanum; foliis rhombeis dentatis striatis glabris, umbellis paucis, of Linnéus; a genus of the class pentandria; order digynia; but more generally, and in greater abundance, by making an incision in the stalk, a few inches above the root, from which it immediately issues, and soon becomes sufficiently concrete to be gathered. It is imported into England from Turkey and the East Indies, in large, softish, ductile, pale-coloured masses, which, by age, acquire a brownish yellow appearance: these are intermixed with distinct whitish tears, that are the most pure part of the mass. Galbanum holds a middle rank between assafœtida and ammoniacum, but its fœtor is very inconsiderable, especially when compared with the former; it is therefore accounted less antispasmodic, nor are its expectorant qualities equal to those of the latter; it however is esteemed more efficacious than either in hysterical disorders. Externally it is often applied by surgeons to expedite the suppuration of indolent tumours, and by physicians as a warm stimulating plaster. It is an ingredient in the pilulæ galbani compositæ, the emplastrum galbani compositum of the London Pharmacopœia, and in the emplastrum ad clavos pedum of the Edinburgh. See Bubon.

Galbanum forms, with water, by trituration, a milky liquor, but does not perfectly dissolve in water, vinegar, or wine. Rectified spirit takes up more than either of those menstrua, but not the whole; and forms a tincture of a bright golden colour. A mixture of two parts of alcohol and one of water is capable of dissolving it entirely.

GALBULA. Jacamar. In zoology, a genus of the class aves, order picæ. Bill straight, very long, quadrangular, point red, nostrils oval at the base of the bill; tongue short, sharp-pointed; thighs downy on the fore-part; feet scansile. Four species; all of which inhabit South America; generally about the size of a lark; feed on insects, and some of them fly in pairs.

GALDA GUMMI. This is a gum-resin mentioned by old writers, but totally forgotten in the present day. Externally, it is of a brown colour, but white within, of a hard lamellated structure, and smells and tastes somewhat like elemi. When burnt, it gives out an agreeable odour. It was formerly used as a warm stimulating medicine, and applied in plasters as a corroborant.

GALE. (*gabling*, hasty, Ger.) A wind not tempestuous, yet stronger than a breeze (*Milton*).

Gale, or Sweet willow, in botany. See Myrica.

Gale (Dr. John), an eminent and learned minister among the baptists, was born at London in 1680. He studied at Leyden, where he distinguished himself very early, and afterwards at Amsterdam under Dr. Limborch. He was chosen minister of the baptist congregation at Barbican; where his preaching, being chiefly practical, was greatly resorted to by people of all persuasions. Four volumes of his sermons were published after his death, which happened in 1721. His Reflections on Dr. Wall's History of Infant-baptism is esteemed the best defence of the baptists ever published; and the reading of that performance induced the learned Mr. William Whiston, Dr. Foster, and some say sir Isaac Newton, to become baptists.

Gale (Theophilus), an eminent divine among the non-conformists, was born in 1628 at King's-Teignton, in Devonshire. He received his academical education at Magdalen college, Oxford, where he took his degree in arts, and was chosen fellow. He was invited to Winchester in 1657, where he preached till 1661, when refusing to comply with the act of uniformity, he was silenced, and deprived of his fellowship. He was then appointed tutor to the two sons of Philip lord Wharton, whom he accompanied to Caen, in Normandy. In 1665 he returned to England, and became pastor to a dissenting congregation, and also master of a seminary at Newington. He died in 1678, bequeathing his estate to trustees for the support of students of his own persuasion, and his excellent library toward promoting useful learning in New-England. He wrote many works, the principal of which is his Court of the Gentiles, a very learned production, in which the author undertakes to prove, that the theology and philosophy of the ancient pagans were borrowed from the scriptures. (*Watkins*).

Gale (Thomas), a learned English divine, born in 1636, at Scruton, in Yorkshire. He was educated at Westminster school, from whence he was elected to Trinity college, Cambridge, of which he was chosen fellow. He was celebrated for his acquaintance with the Greek language and antiquities. His knowledge of the former procured him the regius professorship. In 1671 he published an edition of the ancient mythologic writers, physical and moral, in Greek and Latin. In 1672 he was chosen master of St. Paul's school. In 1675 he received the degree of B. and D.D. and in 1676 was collated to a prebend in the cathedral of St. Paul. He was elected a member of the Royal Society, to which he presented many curiosities, particularly a Roman urn, with the ashes, found near Beckenham, in Surrey. In 1697 he was promoted to the deanery of York. He died at his deanery in 1702, and was interred in the choir of his cathedral. Dean Gale wrote many learned works. (*Watkins*).

GALEA, in antiquity, a light casque, or

head-piece, commonly of brass. Hence the helmet-bearers were called galearii.

GALEA, (in botany, from *galea*, Lat. an helmet.) The upper lip of a ringent corol. Linnéus uses the words labium superius or upper lip.

GA'LEATED. *a.* (*galeatus*, Latin.) 1. Covered as with a helmet (*Woodward*). 2. (In botany.) Such plants as bear a flower resembling a helmet, as the monkshood.

GALEGA, in botany, a genus of the class diadelphia, order decandria. Calyx with subulate teeth, nearly equal; legume with oblique streaks between the seeds. Thirty-six species; some few with tennate, the greater part with pinnate leaves. Chiefly of the Cape, South America, and India; some few natives of the south of Europe; and among these G. officinalis with pinnate, lanceolate, mucronate, glabrous leaves; lanceolate, arrow-shaped stipules, erect, stiff legumes, known very generally by the name of goats-rue, and formerly an article in various pharmacopœias.

GALEN. See GALENUS.

GALENA. (from γαλιμ, to shine.) An ore of lead in which that metal is combined with sulphur; and hence, when separated from impurities, it is termed, chemically, sulphuret of lead; it is the most usual form in which lead is obtained from the mine. (See LEAD.) There are several varieties of galena, distinguished principally by the difference of their external appearance, whether occurring in grains, with facets, or in crystals. They generally contain a small proportion of silver. Galena is of a blueish-grey colour, like lead, but brighter, and of a metallic lustre. Before the blow-pipe it decrepitates, and melts with a sulphureous smell. When first taken from the mine it contains from ·45 to ·83 lead, and from ·086 to ·16 sulphur. Its specific gravity varies from 7·22 to 7·857.

GALENA (Antimoniated), a species of lead ore in which antimony is found in combination with the sulphuret above mentioned.

GALENA (Compact), of a closer texture than the preceding, is sometimes, but not frequently, found in Derbyshire, Germany, and Italy. It is so much like plumbago, that it is often mistaken for it.

GALENA (False, Mock-lead), or BLENDE, a substance thus called, because, though it appears to resemble an ore of lead, it contains none of that metal. Since the former name was imposed, the substance has proved to be an ore of zinc, containing that metal in union with sulphur; and hence termed sulphuret of zinc.

GALENA OF IRON, is sometimes applied to a crystallized ore of that metal.

GALENA, in botany, a genus of the class octandria, order digynia. Calyx four-cleft; corolless; capsule roundish, two seeded. Two species; natives of Africa and the Cape.

GALENIC, in medicine, is that manner of considering and treating diseases founded on the principles of, or introduced by Galen. This author, collecting and digesting what the physicians before him had done, and explaining every thing according to the strictest doctrine of the Peripatetics, put physic on a new footing: he introduced the doctrine of the four elements; the cardinal qualities and their degrees; and the four humours or temperaments.

GALENIC is more frequently used as contradistinguished from chemical.

GALENISTS, a denomination given to such physicians as practise, prescribe, or write, on the galenical principles, and stand opposed to the chemists. At present the galenists and chemists are pretty well accommodated; and most of our physicians use the preparations and remedies of both.

GALENISTS, or GALENITES, in church-history, a branch of Mennonites or Baptists, who take in several of the opinions of the Socinians, or rather Arians, touching the divinity of our Saviour. In 1664 the Waterlandians were divided into two parties, of which the one were called Galenists, and the other Apostolians. They are thus called from their leader Abraham Galenus, a learned and eloquent physician of Amsterdam, who considered the Christian religion as a system that laid much less stress on faith than practice, and who was for taking into the communion of the Mennonites all those who acknowledge the divine origin of the books of the Old and New Testament, and led holy and virtuous lives.

GALENUS (Claudius), a celebrated physician in the age of M. Antoninus and his successors, born at Pergamus. He visited the most learned seminaries of Greece and Egypt; and at last came to Rome, where he soon rendered himself famous by his profession. Many, astonished at his cures, attributed them to magic. He was very intimate with Marcus Aurelius, the emperor, after whose death he returned to Pergamus, where he died, in his 90th year, A.D. 193. He wrote no less than 300 volumes, the greater part of which were burnt in the temple of Peace at Rome, where they had been deposited. To Galen and Hippocrates the moderns are indebted for many useful discoveries. The best editions of Galen's remaining works are, the Basil edition of 1538, in 5 vols., and that of Venice in 1625, in 7 vols.

GALEOBDOLON. Yellow dead-nettle. In botany, a genus of the class didynamia, order gymniospermia. Calyx five cleft, unequal awned; upper lip of the corol very entire and vaulted; lower lip three-cleft, with all the divisions acute. One species; common to the moist shades of our own country.

GALEON. See GALLEON.

GALEOPSIS. (*galeopsis*, καληοψις, from καλος, good, and οψις, vision, so called, because it was thought good for the sight; or from γαλη, a cat, and οψις, aspect, the flowers gaping like the open mouth of an animal.) Hemp-nettle. In botany, a genus of the class didynamia, order gymniospermia. Calyx five-cleft, awned; upper lip of the corol vaulted, and crenate, lower lip with two teeth on its

upper side. Four species; all indigenous to our own corn-fields. See LAMIUM ALBUM.

GALERI'CULATE. *a.* (from *galerus*, Latin.) Covered as with a hat.

GALERICULUM, a cap of skin worn both by men and women amongst the Romans.

GALERICULUM APONEUROTICUM. The tendinous expansion which lies over the pericranium.

GALFALLY, a town of Ireland, in the county of Tipperary. Lat. 52. 15 N. Lon. 8. 20 W.

GALICIA, a large country in the S. of Poland, which was forcibly seized by the Austrians in 1772. It consists of that part of Little Poland which is on the S. side of the river Vistula, almost the whole of Red Russia, and a slip of Podolia; and it is incorporated into the Austrian dominions, under the appellation of the kingdoms of Galicia and Lodomeria; which kingdoms, as the court of Vienna alleged, some ancient diplomas represent as situated in Poland, and subject to the kings of Hungary; but their most powerful and convincing argument was the *ultima ratio regum*, derived from an army of 200,000 men.

GALICIA, a province of Spain, having the Atlantic ocean on the N. and W. Portugal on the S. and Asturias and Leon on the E. It is but thinly peopled, and its produce is wine, flax, and citrons.

GALILEANS, a sect of the Jews. Their founder was one Judas, a native of Galilee, from which place they derived their name. Their chief, esteeming it an indignity for the Jews to pay tribute to strangers, excited his countrymen against the edict of the emperor Augustus, which had ordered a taxation or enrolment of all the subjects of the Roman empire. They pretended that God alone should be owned as master and lord; and in other respects were of the opinion of the pharisees: but, as they judged it unlawful to pray for infidel princes, they separated themselves from the rest of the Jews, and performed their sacrifices apart.

GALILEE, anciently a province of Judea, but now of Turkey in Asia. Its bounds are not now certainly known.

GALILEO (Galilei), the famous mathematician and astronomer, was the son of a Florentine nobleman, and born in the year 1564. He had from his infancy a strong inclination to philosophy and the mathematics, and made prodigious progress in these sciences. In 1592 he was chosen professor of mathematics at Padua, and during his abode there he invented, it is said, the telescope; or, according to others, improved that instrument, so as to make it fit for astronomical observations. (See ASTRONOMY.) In 1611, Cosmo II, grand duke of Tuscany, sent for him to Pisa, where he made him professor of mathematics, with a handsome salary; and soon after, inviting him to Florence, gave him the office and title of principal [illegible] and mathematician to his [illegible] but a few years at Florence before he was convinced by sad experience, that Aristotle's doctrine, however ill-grounded, was held too sacred to be called in question. Having observed some solar spots in 1612, he printed that discovery the following year at Rome; in which, and in some other pieces, he ventured to assert the truth of the Copernican system, and brought several new arguments to confirm it. For these he was cited before the inquisition; and, after some months imprisonment, was released upon a simple promise, that he would renounce his heretical opinions, and not defend them by word or writing. But having afterwards, in 1632, published at Florence his Dialogues of the two greatest Systems of the World, the Ptolemaic and Copernican; he was again cited before the inquisition, and committed to the prison of that ecclesiastical court at Rome. In June, in the same year, the congregation convened, and in his presence pronounced sentence against him and his books, obliging him to abjure his errors in the most solemn manner; committed him to the prison of their office during pleasure; and enjoined him, as a saving penance, for three years to come, to repeat once a week the seven penitential psalms: reserving to themselves, however, the power of moderating, changing, or taking away altogether or in part, the said punishment or penance. On this sentence, he was detained in prison till 1634; and his Dialogues of the System of the World were burnt at Rome.

Galileo lived ten years after this; seven of which were employed in making still further discoveries with his telescope. But by the continual application to that instrument, added to the damage his sight received from the nocturnal air, his eyes grew gradually weaker, till he became totally blind in 1639. He bore this calamity with patience and resignation, worthy of a great philosopher. The loss neither broke his spirit, nor stopped the course of his studies. He supplied the defect by constant meditation; by which means he prepared a large quantity of materials, and began to arrange them by dictating his ideas; when by a distemper of three months continuance, wasting away by degrees, he expired at Arcetri near Florence, in January 1642, being the 78th year of his age.

Galileo was in his person of small stature, though of a venerable aspect, and vigorous constitution. His conversation was affable and free, and full of pleasantry. He took great delight in architecture and painting, and designed extremely well. He played exquisitely on the lute; and whenever he spent any time in the country, he took great pleasure in husbandry. His learning was very extensive: and he possessed in a high degree a clearness and acuteness of wit. From the time of Archimedes, nothing had been done in mechanical geometry, till Galileo, who being possessed of an excellent judgment, and great skill in the most abstruse points of geometry, first extended the boundaries of that science, and began to reduce the resistance of solid bodies to its laws. Besides applying geometry to the doctrine of motion, by

which philosophy became established on a sure foundation, he made surprising discoveries in the heavens by means of his telescope; and thus made the evidence of the Copernican system more sensible. He was the first who demonstrated that the spaces described by heavy falling bodies are as the squares of their times of motion; and that a body projected in an oblique direction describes a parabola. He invented the cycloid; likewise the simple pendulum; and thought of applying it to clocks, but did not execute that design. He discovered that air had gravity, and endeavoured to compare it with water. In short, he will ever be admired by true philosophers, as the great man who opened vast fields for their enquiries, and ably assisted them therein by his inventions and discoveries.

Galileo wrote a number of treatises, many of which were published in his life-time. Most of them were also collected after his death, and published by Mendessi in 2 vols. 4to., under the title of L'Opere di Galileo Galilei Lynceo, in 1656. Some of these, with others of his pieces, were translated into English and published by Thomas Salisbury, in his Mathematical Collections, in 2 vols. folio. A volume also of his letters to several learned men, and solutions of several problems, was printed at Bologna in 4to.

A correct translation of the sentence passed upon Galileo, and of his abjuration of the *errors and heresies* which he held respecting the earth and sun, is given in the Monthly Magazine, for Feb. 1802.

GALINACEUS LAPIS. See GALLINACEUS.

GALINSO'GEA, in botany, a genus of the class syngenesia, order polygamia superflua. Receptacle chaffy; down many-leaved, chaffy; calyx imbricate. Two species; natives of Peru.

GA'LIOT. *s.* (*galiotte*, Fr.) A little galley or sort of brigantine, built very slight and fit for chase (*Knolles*).

GALI'PEA, in botany, a genus of the class diandria, order monogynia. Calyx four, or five-sided; four, or five-toothed; corol salver-shaped, deeply four or five-parted; stamens four, two of them barren; pericarp. One species: a Guiana shrub about six feet high, with small flowers in a terminal, few-flowered cyme.

GALIPOT, or BARRAS, a white brittle substance, which, in the winter, is found to incrust the wounds of fir-trees, from which turpentine has been extracted; it consists of rosin united to a small portion of oil.

GALIUM. Bed-straw. In botany, a genus of the class tetrandria, order monogynia. Corol one-petalled, flat, superior; seeds two, roundish. Fifty-three species; chiefly European plants; and thirteen common to the mountains, meadows, hedges, or walls of our own country. Those chiefly of notice are:

1. G. verum. Yellow lady's bed-straw; with leaves in eights, linear, grooved, very entire, rough; flowers in close panicles. These flowers will coagulate boiling milk; and they are said to be employed for this purpose in making Cheshire cheeses. The plant is found wild in our fields.

2. G. mollugo: found wild in our hedges, with leaves in eights, elliptic, rather than obtuse, mucronate, rough at the margin; flowers in spreading panicles. There is another variety with the stem and leaves rough. The expressed juice of this and several other species was formerly in high repute for the cure of epilepsy: but it has long lost its character.

3. G. asparine. Clivers; Goose-grass. Found in our hedges with leaves in eights, lanceolate, carinate, rough, prickly backwards; stem flaccid. The expressed juice was formerly used in cataplasms for discussing glandular tumours; but is now no longer known in the pharmacopœias. Rabbits and some other quadrupeds are fond of the leaves.

GALL. *s.* (ȝeala, Saxon.) 1. The bile, or animal juice remarkable for its supposed bitterness. (See BILE). 2. The part which contains the bile (*Brown*). 3. Any thing extremely bitter (*Shakspeare*). 4. Rancour; malignity (*Spenser*). 5. A sore or hurt occasioned by rubbing off the skin (*South*).

To GALL. *v. a.* (*galer*, French.) 1. To hurt or make sore by rubbing off the skin. 2. Figuratively, to impair, to wear away. 3. To vex; to fret; to teaze; to harass; to disturb.

GALL (St.), or ST. GALLEN, a town of Swisserland, in Thurgau, with a rich abbey. To the valuable library belonging to this abbey, which contains several MSS. of the classics, we are indebted for Petronius Arbiter, Silius Italicus, Valerius Flaccus, and Quintilian, copies of which were found here in 1413. At this town are good manufactures of linen, muslin, and embroidery. Lat. 47. 26 N. Lon. 9. 20 E.

GALL-BLADDER. Vesicula fellis. An oblong membranous receptacle, situated under the liver, to which it is attached in the right hypochondrium. It is composed of three membranes: a common, fibrous, and villous. Its use is to retain the gall, which regurgitates from the hepatic duct, there to become thicker, more acrid, and bitter, and to send it through the cystic duct, which proceeds from its neck into the ductus communis choledochus, to be sent on to the duodenum. It is deficient in some animals, as for example the horse, ass, and antelope.

GALL-FLY, in entomology. See CYNIPS.

GALL-NUT. (*noix de galle*, French; *gallapfel*, German.) An excrescence on various species of the oak-tree, produced, as naturalists affirm, by a puncture made on the leaves, bark, or buds, by various species of the cynips, or gall-fly. The puncture is affirmed to be made by the female insect, which deposits at the same time an egg, that progressively becomes hatched into a larve or grub; and in the situation to which it is entrusted, finds abundance of food as well as a nest duly prepared for it. The perpetual stimulus, which, as a foreign body, it excites from the first, and continues to excite in a still greater degree after it has acquired sensation and motion,

gradually increases the gall-nut to the size in which it generally reaches us, and accounts for its being hollow.

The two species of the oak that afford the most useful gall-nuts, and consequently those most generally sought for in commerce, are, the quercus œgilope, and quercus cerris; both which trees are natives of the Levant. The former kind of gall is principally employed by tanners, though by no means so extensively either in our own country or abroad as it deserves to be: the latter is the officinal gall-nut, and is used for a great variety of purposes: it is found adhering to the soft annual shoots of the tree, and in short, in its original situation and general appearance, is considered by naturalists as precisely similar to those excrescences on our English oaks, vulgarly called oak apples. There are two kinds of gall-nuts distinguished in commerce; the inferior is of a pale brown colour, and about the size of a nutmeg, and is procured from Spain, France, and the northern Mediterranean countries; the superior sort is of a deep olive colour, approaching to black, is smaller than the other, and its specific gravity is considerably greater: it is produced in Asia Minor, but more especially in Syria, and is hence called the Aleppo gall, this town being the principal seat of the foreign Syrian commerce.

Notwithstanding, however, the concurrent testimony of naturalists, as to the original of the gall-nut, any person who will give himself the trouble to break half a dozen sound unperforated Aleppo galls, may readily convince himself that this is one of those vulgar errors which are repeated and believed from generation to generation, because in philosophy and natural history, it is easier to believe than to examine. Gall-nut consists of four parts. The external or cortical covering is of a dense fibrous texture, a pale yellowish white colour, is very thin, and separable without much difficulty from the part which it encloses: to the taste it is highly astringent, with a slight, and sometimes a scarcely perceptible bitterness: when laid on a red hot iron it smokes and blackens, and finally becomes ignited, but without any flame: the smoke is slightly pungent, accompanied by a peculiar and indescribable odour, which, however, chiefly characterises the resinous part of the gall-nut. Immediately beneath the cortical part lies that which, merely from its external appearance, we shall call the resinous part, and which constitutes by far the greater portion of the gall-nut: the colour of this is dark yellowish brown, it has a fibrous texture, and shows a great tendency to a conchoidal fracture: it has a glimmering resinous lustre, and is very brittle: it is not only astringent to the taste, but nauseously bitter, and appears almost entirely soluble in saliva: when laid on red hot iron it becomes black, and in a state of semifusion, and exhales very copiously that peculiar odour which we have already mentioned; in a short time it is ignited and reduced to ashes, but without producing any flame. The central cavity of the gall-nut is lined with a very pale yellowish brown shell, adhering pretty firmly to the resinous part; it is of a fibrous texture, without lustre; to the taste it is almost wholly insipid like common ligneous fibre, and, like this, when laid on a red hot iron it burns with a yellowish flame, and a copious production of very penetrating pyroligneous acid. Within the shell is contained the kernel, which egg-shaped body, sometimes considerably flattened, and a quarter of an inch or more in length: it is of a brown cream colour, and an even very minutely granular fracture like a common hazel-nut; it breaks down between the teeth like all the oily farinaceous seeds when dried: it is insipid, but, after being chewed, leaves a faint sweetish flavour like that of a bad almond; it is often found mouldy, and then is of a bright chocolate colour. When laid on a hot iron it becomes somewhat moist, and gives a pungent empyreumatic acid in great quantity, but without flaming, and is probably little else than an amylaceous fecula. This kernel no doubt it is which invites the depredation of insects; and in all those gall-nuts, the kernels of which have been devoured, may be perceived a small tubular passage from the outside to the centre, and in the place of the kernel is generally left a little web, and some minute black grains which probably are the excrements of the insect. Gall-nuts that are unperforated are sometimes, however, found hollow; but this may be inferred to be owing to the destruction of the kernel by spontaneous decomposition, on account of the mouldy and discoloured state of the remaining shell.

No chemical analysis has been made of any one of the four parts of the gall-nut separated from the rest, although what we have called the resinous portion seems to be particularly interesting: the gall-nut in general, however, has been subjected to several curious enquiries by Scheele, Deyeux, Proust, Davy and others, of which the following are the principal results.

When bruised galls are infused in distilled water at the temperature of about 60° Fahr. a dark brown fluid is obtained in the space of a few hours, this being poured off, and another portion of water being added, a second infusion is procured of a somewhat lighter colour than the former; after having thus employed four or five separate parcels of water, the succeeding infusion exhibits a yellowish green tinge, which by degrees becomes more and more faint, till all that portion of gall-nut soluble in this menstruum at the above temperature is taken up. According to Deyeux, it requires 96 quarts of water divided into 20 different macerations, to exhaust all the soluble matter of a single pound of galls. The brown infusion acquires a deep black colour by red sulphat of iron, indicating the presence of gallic acid; a solution of isinglass in water occasions in it a copious precipitate, indicating tan, and muriat of alumine throws down a precipitate denoting the presence of extract. This brown infusion seems to be furnished almost entirely by the resinous part of the nut. The light green infusion gives a deep blue precipitate with red sulphat of iron, but is hardly at all affected by the other two reagents; it appears to contain little else than gallat of lime, and is probably furnished by the cortical covering of the gall-nut. A few drops of moderately strong sulphuric or muriatic acid change the green tinge of this infusion to red, after which the original colour may be restored by the addition of an alkali, and deepened if it is added to excess. The concentrated nitric and oxygenated muriatic acids destroy the colour of the infusion, nor can it be restored by any alkali. By long continued slow evaporation, the green colour is changed into a dirty yellow, and then neither acids nor alkalies act on it in the same manner as before. The strongest brown infusion that can be made by macerating pounded galls with distilled water at

56° Fahr. is of the specific gravity of 1·068, and yields by evaporation a little more than $\frac{1}{8}$ of solid matter. The solution is nearly transparent, of a yellowish brown colour, and a sour and highly astringent taste; it strongly reddens litmus, and shows other proofs of a disengaged acid. When sulphuric acid is poured into the infusion, dense white precipitate is thrown down, and the supernatant liquor becomes of a deeper colour than before: it is not, however, by this process, freed entirely from any of its ingredients, since it still continues to give a deep black with the oxygenated salts of iron, and to afford a precipitate with gelatin. The sulphuric precipitate, when separated by the filter, slightly reddens vegetable blues, yields gallic acid by distillation, and when dissolved in warm water, gives a copious precipitate with isinglass. Muriatic acid produces a similar effect on the infusion to that of sulphuric acid. Strong nitric acid, when first added to the infusion, renders it turbid, but the separating matter is soon dissolved with effervescence, and the liquor becomes clear and of an orange colour: the excess of acid being saturated by an alkali, both the tan and gallic acid of the infusion are found to be destroyed, for no precipitate is occasioned by a solution of gelatin, nor any change of colour by red sulphat of iron. By evaporation, a soft yellowish brown substance is procured, which from its decomposing nitro muriat of tin and nitrat of alumine, appear to be a kind of extract. If a very diluted nitric acid is employed, its effects on the infusion are similar to those of the sulphuric and muriatic acids.

A solution of either of the fixed alkalies, in a perfectly caustic state, occasions a temporary turbidness in the infusion, and changes its colour to brown red; in this state it gives no precipitate with gelatin till the addition of an acid, when a copious sediment is procured. Caustic ammonia, at a moderate temperature, has the same effect as fixed alkali; but when the mixture is exposed to the heat of boiling water, part of the ammonia is volatilized, and the remainder reacts on the tan and gallic acid of the infusion, converting them almost entirely into a substance precipitable by muriat of tin and aluminous salts.

If instead of a perfectly caustic fixed alkali, one that is only partially so be employed, a precipitate is thrown down from the infusion, the quantity of which varies in proportion to that of the carbonic acid united with the alkali. That the formation of this precipitate depends on the presence of carbonic acid is manifest from this circumstance, that if carbonic acid gas is passed through the residual clear liquor, consisting of caustic alkali and infusion of galls, an immediate precipitate is occasioned, which exhibits the same properties as that produced by carbonated alkali in the infusion. The following are the characters of the precipitate: it has not the astringent taste of uncombined tan; it is but imperfectly soluble in cold water or alcohol; when digested in a large quantity of hot water it is separated into an insoluble and a soluble part; the former of these is not acted on by alcohol, it is partially soluble in muriatic acid, and the solution precipitates gelatin and the salts of iron; when incinerated it affords a considerable proportion of lime, but no alkali; hence it appears to be a compound of lime, gallic acid, tan, and perhaps a little extract: the part soluble in hot water is incapable of precipitating gelatin, till the alkali is saturated by an acid, and when incinerated it yields carbonated alkali.

The alkaline earths, when added in substance or in solution to the brown infusion of galls, combine with the whole of the tan, and throw down a green precipitate: the supernatant liquor is also of a green colour, which becomes more intense by exposure to the air: it is made turbid by sulphuric acid, and gives a black precipitate with the salts of iron, and consists of gallic acid, and probably some extract, combined with part of the alkaline earth. The green precipitate, by repeated washing with water, gives out nearly the whole of its gallic acid, and the residue is little else than tan with the alkaline earth. The artificial carbonats of these earths produce the same effect as the pure earths.

If alumine is boiled with the infusion it becomes of a yellowish grey tinge, and combines with the whole of the tan and extract, and nearly the whole of the gallic acid; the supernatant liquor being clear and colourless, and giving a very faint purple with red sulphat of iron: if only a very small proportion of alumine be employed, the liquor consists of gallat of alumine with excess of acid.

The perfect oxyds of tin and zinc prepared with nitric acid, when boiled with the infusion, become of a dull yellow colour, and reduce the supernatant fluid to mere water; the yellow oxyds are soluble in muriatic acid, and then give a copious precipitate with gelatin, and a dense black with salts of iron.

The compound earthy and alkaline salts also decompose the infusion of galls, but the precipitate is not pure tan as has been supposed, for it contains besides some gallic acid, extract, and the precipitant salt. The same may be observed of most of the metallic salts.

When the brown infusion is exposed to gentle evaporation, it first becomes turbid by the deposition of part of its extractive matter, and at length acquires the consistence and appearance of a tough brown extract, which, while it is warm, may be moulded like Chio turpentine, but, when it becomes cold, is dry and hard, and very easily pulverizable. By exposure in close vessels to a heat superior to that of boiling water, the mass first softens, then swells and gives out a prodigious quantity of carbonic acid; there sublimes at the same time a white salt in needles and scales, which is pure gallic acid; soon after a fluid arises in which the gallic acid disolves, and this is succeeded by a thick black oil; at this period the gas, which hitherto has been carbonic acid, becomes inflammable, and so continues till nothing but a dry coal is left in the retort.

An exact analysis of galls is for the present at least impracticable, since we are not acquainted with any reagents that will separate any of its component parts unmixed with the others: upon the whole, perhaps, the best mode of proceeding is as follows: Take any quantity of galls and reduce them to powder, then by means of repeated infusions with water at a temperature less than that of ebullition, extract every thing that is soluble. The residue being thoroughly dried will indicate with considerable exactness, by means of its loss of weight, the amount of soluble matter. All the different infusions being mixed together are to be evaporated at a very gentle heat to a small bulk, during which some reddish brown extract will be deposited, and must be carefully

separated and dried; the residual fluid, by subsequent evaporation, is to be brought to a solid state, and then digested in pure alcohol, by which the tan, gallic acid, and extract, will be taken up, while the mucilage mixed with some impurities will remain insoluble, and may thus be separated. The alcoholic solution being again evaporated, the residue is to be dissolved in water, and a strong solution of isinglass is to be poured in as long as any precipitation takes place: this precipitate when well washed consists of tan, and gelatin, with a very little extract and gallic acid, and contains about 46 per cent. of tan. The rest of the solution is gallat of lime with excess of acid, and a little extract. According to Davy, 500 grains of good Aleppo galls contain 185 grains of matter soluble in water, and this consists of

	Grains.
Tan	130
Mucilage and extract deposited during evaporation	12
Gallic acid with a little extract	31
Lime and saline matter	12

For further particulars concerning gall-nut, see GALLIC ACID, INK, and TANNING.

The uses of this substance are very important. It is employed largely in dyeing not only blacks and various kindred colours, but is also an essential ingredient in the composition of the finest madder reds: it is a necessary part of all the black writing inks: it is employed in the laboratory as a useful test for the salts of iron, and is occasionally used in medicine.

GALL-STONES. Biliary concretions. Hard concrete bodies, of which there are great varieties, formed in the gall-bladder of animal bodies.

In general, they proceed from a superabundance of the resinous oil of the secreted bile in comparison with its water and coagulable lymph, in consequence of which it crystallizes; and hence chemical analysis has generally found these calculi to consist of nothing more than an oily concrescible resinous matter, yet, when lodged in the pores or parenchymatous substance of the liver and gall-stones, are often productive of various and violent diseases.

GALLA, an Abyssinian nation, originally dwelling, as Mr. Bruce supposes, under the line, and exercising the profession of shepherds, which they still continue to do. For a number of years, our author tells us, they have been constantly migrating northwards, though the cause of this migration is not known. At first they had no horses; the reason of which was, that the country they came from did not allow these animals to breed: but, as they proceeded northward and conquered some of the Abyssinian provinces, they soon furnished themselves with such numbers, that they are now almost entirely cavalry, making little account of infantry in their armies. On advancing to the frontiers of Abyssinia, the multitude divided; and part directed their course towards the Indian Ocean; after which, having made a settlement in the eastern part of the continent, they turned southward into the countries of Bali and Dawaw, which they entirely conquered, and settled there in the year 1537. Another division, having taken a westerly course, spread themselves in a semicircle along the banks of the Nile; surrounding the country of Gojam, and passing eastward behind the country of the Agows, extended their possessions as far as the territories of the Gongas and Gafats. Since that time, the Nile has been the boundary of their possessions; though they have very frequently plundered, and sometimes conquered, the Abyssinian provinces on the other side of the river, but have never made any permanent settlement in these parts. A third division has settled to the southward of the low country of Shoa, which the governor of that province has permitted, in order to form a barrier betwixt him and the territories of the emperor, on whom he scarcely acknowledges any dependence.

The Galla are below the middle size, of a brown complexion, and have long black hair; but some of them who live in the valleys are entirely black. At first their common food was milk and butter; but, since their intercourse with the Abyssinians, they have learned to plough and sow their land, and to make bread. They seem to have a predilection for the number seven, and each of the three divisions already mentioned are subdivided into seven tribes. In their behaviour they are extremely barbarous, and live in continual war with the Abyssinians, whom they murder without mercy as often as they fall into their hands. They cut off the privities of the men, and hang them up in their houses by way of trophies; and are so cruel as to rip up women with child, in hopes of thus destroying a male. Yet, notwithstanding their excessive cruelty abroad, they live under the strictest discipline at home; and every broil or quarrel is instantly punished according to the nature of the offence. Each of the three divisions of the Galla above mentioned has a king of its own; and they have also a kind of nobility, from among whom the sovereigns can only be chosen: however, the commonalty are not excluded from rising to the rank of nobles, if they distinguish themselves very much in battle.

GALLÆ. (from *Gallus*, the river in Bythinia from whose banks they were first brought.) Galls. The nut-gall of the oak, is an excrescence produced on different parts of the tree, the young branches, leaves and buds, in consequence, as is said by naturalists, of the deposit of the egg of the insect called CYNIPS (which see); many varieties of which make for this purpose a puncture into the tree with their pointed snout, and then deposit the egg, whose acrimony, by exciting a new action in the vegetable vessels, produces the excrescence of the nut-gall.

GALLAM, the capital of a kingdom of the same name, in Africa, on the river Senegal. Lat. 14. 25 N. Lon. 9. 55 W.

GA'LLANT. *a.* (*galant*, French.) 1. Gay; well dressed; showy; splendid; mag-

nificent (*Isaiah*). 2. Brave; high spirited; daring; magnanimous (*Digby*). 3. Fine; noble; spacious (*Clarendon*). 4. Inclined to courtship (*Thomson*).

GA'LLANT. *s.* (from the adjective.) 1. A gay, sprightly, airy, splendid man (*Dryden*). 2. A whoremaster, who caresses women to debauch them (*Addison*). 3. A wooer; one who courts a woman for marriage.

GA'LLANTLY. *ad.* (from *gallant.*) 1. Gayly; splendidly. 2. Bravely; nobly; generously (*Swift*).

GA'LLANTRY. *s.* (*galanterie*, French.) 1. Splendour of appearance; show; magnificence (*Waller*). 2. Bravery; nobleness; generosity (*Glanville*). 3. A number of gallants (*Shakspeare*). 4. Courtship; refined address to women. 5. Vitious love; lewdness; debauchery (*Swift*).

GALLATS, a genus of salts formed by the union of gallic acid with different substances. A small number only has been noticed, and these are but imperfectly known.

GALLAT OF ALUMINE, is formed by mixing a small portion of alumine with the infusion of nut-galls, and suffering the water to escape by evaporation. This is the only gallat that has yet been obtained in the state of crystals. The quantity of alumine is too small completely to disguise the properties of the acid.

GALLAT OF IRON is produced in the making of ink, and other similar processes, when the acid unites with and precipitates the metal.

GALLATS (Alkaline and Earthy). If an alkali or an alkaline earth be dropped into a solution of gallic acid in water, or into a solution containing that acid, the compound assumes a green colour, and the acid enters into combination with the earth employed. But it is impossible to procure any one of these gallats in a separate state; for during the process of evaporation the green colour disappears, and the acid is decomposed.

GA'LLEASS. *s.* (*galeas*, French.) A heavy low-built vessel, with both sails and oars (*Addison*).

GA'LLEON. *s.* (*galion*, French.) A large ship with four and sometimes five decks (*Raleigh*).

GALLEON, in naval affairs, a sort of ships employed in the commerce of the West Indies. The Spaniards send annually two fleets; the one for Mexico, which they call the flota; and the other for Peru, which they call the galleons. By a general regulation made in Spain, it has been established, that there should be 12 men of war and five tenders annually fitted out for the armada or galleons. They are appointed to sail from Cadiz in January, that they may arrive at Porto Bello about the middle of April; where, the fair being over, they may take aboard the plate, and be at Havannah with it about the middle of June; where they are joined by the flota, that they may return to Spain with the greater safety. Galleons have generally four, and sometimes five, decks.

GALLEOT. See GALEOT.

GALLERY, in architecture. 1. A kind of walk along the floor of a house into which the doors of the apartments open (*Sidney*). 2. The seats in the playhouse above the pit, in which the meaner people sit (*Pope*).

Savot, in his Architecture, derives the word gallery from Gaul, as supposing the ancient Gauls to have been the first who used them. Nichod fetches it from the French *aller*, to go; *allerie*: others bring it from *galere*, galley; because it bears some resemblance thereto in respect of length. In the corrupt Latin we meet with *galilæa*, for the gallery of a monastery.

The galleries of the Louvre are magnificent; a gallery of painting; a complete apartment is to consist of a hall, anti-chamber, chamber, cabinet, and gallery.

GALLERY, in fortification, a covered walk across the ditch of a town, made of strong beams, covered over head with planks, and loaded with earth; sometimes it is covered with raw hides to defend it from the artificial fires of the besieged. Its sides should be musquet proof.

GALLERY OF A MINE, is a narrow passage, or branch of a mine carried on underground to a work designed to be blown up. Both the besiegers and the besieged also carry on galleries in search of each other's mines, and these sometimes meet and destroy each other.

GALLERY, in ship-building, a balcony, projecting from the stern or quarter of a ship of war, or of a large merchantman: the stern-gallery is wholly at the stern of the ship, and is usually decorated with a balustrade extending from one side of the ship to the other; the fore-part is limited by a partition, in which are framed the cabin windows, and the roof of it is formed by a sort of vault termed the cove, which is frequently ornamented with sculpture. Quarter-gallery is that part which projects on each quarter, and is generally fitted up as a water closet. Ships of twenty guns and upwards, on one deck, have quarter galleries, but no stern gallery; two and three deckers have quarter galleries, with their proper conveniences, and one or two stern galleries.

GALLEY, a kind of low flat-built vessel, furnished with one deck, and navigated with sails and oars, particularly in the Mediterranean. By the Greek authors under the eastern empire this kind of vessel was called γαλαια and γαλεια, and by the Latin authors of the same time, *galea*; whence, according to some, the modern denomination. Some say it was called galea, on account of a casque or helmet which it carried on its prow, as Ovid attests, de Tristibus. The French call it *galere*; by reason, they say, that the top of the mast is usually cut in the form of a hat, which the Italians call *galero*. Others derive both galea and galere from a fish, by the Greeks called γαλεωτης or ξιφιας, and by us the *sword-fish*, which this vessel resembles. Lastly, others derive the galleo, galea, galere, galeasse, &c. from the

Syriac and Chaldee gaul and gallin, a man exposed on the water in a vessel of wood.

The larger sort of these vessels is employed only by the Venetians. They are commonly 162 feet long above, and 133 feet by the keel, 32 feet wide, and 23 feet length of stern-post. They are furnished with three masts, and 32 banks of oars; every bank containing two oars, and every oar being managed by six or seven slaves, who are usually chained thereto. In the fore-part they have three little batteries of cannon, of which the lowest is of two 36-pounders, the second of two 24-pounders, and the uppermost of two 2-pounders: three 18-pounders are also planted on each quarter. The complement of men for one of these galleys is 1000 or 1200. They are esteemed extremely convenient for bombarding or making a descent upon an enemy's coast, as drawing but little water; and having by their oars frequently the advantage of a ship of war, in light winds or calms, by cannonading the latter near the surface of the water; by scouring her whole length with their shot, and at the same time keeping on her quarter or bow, so as to be out of the direction of her cannon.

The galleys next in size to these, which are also called half-galleys, are from 120 to 130 feet long, 18 feet broad, and 9 or 10 feet deep.

GALLEY, in chemistry, a particular kind of reverberatory furnace, in which several retorts may be placed at the sides of each other. It is of an oblong shape, and has lateral openings, and derives its name from its supposed resemblance to a naval galley.

GALLEY-SLAVE. A man condemned for some crime to row in the galleys.

GALLEY-WORM, in zoology. See JULUS.

GALLI, in antiquity, a name given to the eunuch-priests of Cybele.

GALLI, the Gauls. See GALLIÆ and GAULS.

GALLI, five small desolate isles on the coast of the Principato Citra of Naples.

GALLIA, a large country of Europe, called Galatia by the Greeks. The inhabitants were called Galli, Celtæ, Celtiberi, and Celtoscythæ. Ancient Gaul was divided into four different parts by the Romans, called Gallia Belgica, Narbonensis, Aquitania, and Celtica. Gallia Belgica was the largest province, bounded by Germany, Gallia Narbonensis, and the German Ocean; and contained the modern country of Alsace, Lorraine, Picardy, with part of the Low Countries, and of Champagne, and of the isle of France. Gallia Narbonensis, which contained the provinces lately called Languedoc, Provence, Dauphiné, Savoy, was bounded by the Alps and Pyrenean mountains, by Aquitania Belgium, and the Mediterranean. Aquitania Gallica, afterwards the provinces of Poitou, Santonge, Guienne, Berry, Limosin, Gascony, Auvergne, &c. was situated between the Garumna, the Pyrenean mountains, and the ocean. Gallia Celtica, or Lugdunensis, was bounded by Belgium, Gallia Narbonensis, the Alps, and the [illegible] It contained the country heretofore known by the name of Lyonnois, Touraine, Franche Comté, Senenois, Switzerland, and part of Normandy. Besides these grand divisions, there is often mention made of Gallia Cisalpina, or Citerior, Transalpina or Ulterior, which refers to that part of Italy which was conquered by some of the Gauls who crossed the Alps. By Gallia Cisalpina, the Romans understood that part of Gaul which lies in Italy, and by Transalpina, that which lies beyond the Alps in regard only to the inhabitants of Rome. Gallia Cispadana and Transpadana is applied to a part of Italy conquered by some of the Gauls; and then it means the country on this side of the Po, or beyond the Po with respect to Rome. By Gallia Togata, the Romans understood Cisalpine Gaul, where the Roman gowns togæ were usually worn. Gallia Narbonensis was called Braccata, on account of the peculiar covering of the inhabitants for their thighs. The epithet of Comata is applied to Gallia Celtica, because the people suffered their hair to grow to an uncommon length. The inhabitants were great warriors, and their valour overcame the Roman armies, took the city of Rome, and invaded Greece in different ages. They spread themselves over the greatest part of the world. They were very superstitious in their religious ceremonies, and revered the sacerdotal order as if they had been gods. They long maintained a bloody war against the Romans, and Cæsar resided ten years in their country before he could totally subdue them. See GAUL.

GALLIARD, or GAGLIARDA, in music and dancing, a sort of dance, anciently in great request; consisting of very different motions and actions, sometimes proceeding *terra à terra*, or smoothly along; sometimes capering; sometimes along the room, and sometimes across. The word itself, which is derived from the French, who had it from Italy, signifies gay, merry, &c. The music of the galliard is in triple time.

GA'LLIARDISE. *s.* (French.) Merriment; exuberant gayety: not in use (*Brown*).

GALLIC ACID an acid found to exist plentifully in nut-galls, whence its name is derived; but which may also be extracted from most astringent vegetables, particularly the husks of nuts, the bark of oak, chesnut, ash, hazel, sumach, poplar, elder, elm, sycamore, cherry tree, &c. and various parts of other plants. It is usually found accompanied with the ASTRINGENT PRINCIPLE, and was formerly confounded with that substance: (see that article), also TANNEN. Many of the properties of this acid were discovered by the commissioners of Dijon, in France, who published their account in 1777, in their Elements of Chemistry; but they examined only the infusion of galls, in which the acid is combined with other substances, particularly the tanning principle. Scheele was the first who obtained it in a separate state. Various methods have since been employed for obtaining it, by Bartholdi, Richter, Fiedler, Schnaubert, and others. The following is adopted by Mr. Davy: Boil for some time a

mixture of carbonat of barytes and infusion of nut-galls; the bluish green liquor which results is a solution of gallic acid and barytes. Let this be filtered, and saturated with diluted sulphuric acid. Sulphat of barytes is deposited in the form of an insoluble powder, and a colourless solution of gallic acid remains behind. Deyeux has procured the acid by sublimation from pounded galls in a large glass retort; by cautiously and slowly raising the heat, a number of brilliant white crystalline plates of gallic acid were sublimed. Although this is a very speedy method, much care is necessary in the operation; for if the heat be too great, or the process be not stopped before any oil begins to come over, the experiment will fail.

This acid, when well prepared, crystallizes in the form of brilliant colourless plates, or octahedrons; it is of an acid and somewhat austere taste; and when heated gives out a peculiar and rather unpleasant aromatic odour. It is soluble in 1½ parts of boiling, or 12 parts of cold, water; in this state the acid is very speedily decomposable by heat. It is soluble also in four times its weight of alcohol, at the ordinary temperature; when boiling hot it dissolves a quantity equal to its own weight. It is insoluble in ether; partly decomposable by a strong heat, though a careful sublimation does not alter its properties; and may be entirely decomposed by repeated distillations. Exposure to the air does not alter it, neither do the simple combustibles, or oxygen, or azot, appear to exert any particular action on it. With alkalies, earths, and metallic oxyds, it is capable of uniting and forming gallats.

Gallic acid, or even the simple infusion of galls, from its power of precipitating the greater number of the metals from their solutions, is frequently employed by chemists to detect the presence of these bodies. These precipitates are of different colours, which vary according to the metal held in solution, or its state of oxydizement; those of gold, silver, copper, and chromium, are brown, or some of its shades; of mercury, bismuth, and columbium, orange; of lead, and antimony, white; of nickel, grey; of tellurium, yellow; of uranium, chocolate colour; of titanium, reddish brown; and of iron, with which, of all the metallic oxyds, it has the greatest affinity, black. From solutions of platinum, tin, zinc, cobalt, manganese, and arsenic, it does not appear to throw down any precipitate at all.

Gallic acid occasions a precipitate when poured into acid solutions of glucine, yttria, and zirconia; but it has not that effect on the acid solution of any other earth. It gives to barytes, strontian, and lime-water, a bluish red colour, and throws down a flaky precipitate: upon the aqueous solutions of alkaline salts it produces no effect.

Bouillon Lagrange, who has examined this acid with great attention, is of opinion that neither of the preceding methods, nor any other yet devised, will succeed in obtaining the acid in a state of absolute purity; that the sublimed acid is composed of acetic acid united with a peculiar aromatic volatile oil; that, when otherwise prepared, a portion of tannin, and frequently extractive matter, is combined with it; that the excellent properties of this acid, in the art of dyeing, are owing to the presence of the tannin; and that no process is yet known for depriving it of the whole of its tannin, without reducing it to the state of acetic acid. These particulars, and many others which he has communicated, deserve attention, and may possibly lead to a more accurate determination of the nature of this acid. See Nicholson's Journal, 8vo. vol. 17. p. 58. Also vol. 7. p. 74. Richter's process is detailed in Phil. Mag. xxiii. p. 74.

GA'LLICISM. *s.* (*gallicisme*, French.) A mode of speech peculiar to the French language: such as, he *figured* in controversy (*Felton*).

GA'LLIGASKINS. *s.* (*Caligæ Gallo-Vasconum. Skinner.*) Large open hose (*Philips*).

GALLIMA'TIA. *s.* (*galimatheas*, Fr.) Nonsense; talk without meaning.

GALLIMAU'FRY. *s.* (*galimafrée*, Fr.) 1. A hotch-potch, or hash of several sorts of broken meat; a medley (*Spenser*). 2. Any inconsistent or ridiculous medley (*Shaks*).

GALLINACEUS LAPIS, a glossy substance produced by volcanic fires, the same with the lapis obsidianus of the ancients. A kind of it is brought from Paris, of a beautiful black, resembling the colour of a large crow, in that country named gallinaço.

GALLINÆ. In zoology, the fifth order of the ornothologic class in the Linnéan system, thus ordinally characterized: bill convex, the upper mandible arched, and dilated at the edge over the lower; nostrils half covered with a convex cartilaginous membrane; tail-feathers more than twelve; feet cleft, but connected at the innermost joint. See ZOOLOGY.

GALLINULE, in ornithology. See FULICA.

GALLIO, the proconsul of Achaia, mentioned in Acts xviii. 12. was elder brother to the famous L. Annæus Seneca, the moral philosopher. We know little of the history of his life; but that he was a very amiable man is evident, as well from the portion of scripture history just mentioned, as from the testimony of Seneca himself, who said of him, *Nemo omnium mortalium uni tam dulcis est, quam hic, omnibus.* "No mortal is so agreeable to one person, as this man is to every body."

GA'LLIOT. *s.* (*galiotte*, French.) A small swift galley (*Knolles*).

GALLIPAGA ISLANDS, a number of islands, in the Pacific Ocean, discovered by the Spaniards, to whom they belong. They lie on both sides the equator, the centre island in Lon. 85. 30 W.

GALLIPOLI, a maritime town of Naples, in Italy, 45 miles S.E. of Taranto. Lat. 40. 20 N. Lon. 18. 5 E.

GALLIPOLI, a sea-port town of Romania, in European Turkey. It is 100 miles S.W. of Constantinople. Lat. 40. 26 N. Lon. 26. 59 E.

GALLIPOLI, is also a name given to the strait between European and Asiatic Turkey, otherwise called the Hellespont.

GA'LLIPOT. *s.* (*gala*, Spanish; finery.) A pot painted and glazed, commonly used for medicines (*Fenton*).

GALLIUM. See GALIUM.

GALLO, an island of the Pacific Ocean, near the coast of Peru, the first place possessed by the Spaniards when they attempted the conquest of Peru. Lat. 2. 30 N. Lon. 80.0 W.

GALLOIS (John), a learned Frenchman, was born at Paris in 1632. He was the coadjutor of M. de Sallo, in the celebrated Journal des Sçavans. He was patronised by Colbert, who took him into his house to be taught Latin by him. He was abbé of St. Martin-des-Cores, member of the academy of sciences, and of the French academy; the king's librarian, and Greek professor of the royal college. He died at Paris in 1707.

GALLON, a measure of capacity both for dry and liquid things, containing four quarts; but these quarts, and consequently the gallon itself, are different, according to the quality of the thing measured: for instance, the wine gallon contains 231 cubic inches, and holds eight pounds averdupois of pure water: the beer and ale gallons contain 282 solid inches, and hold ten pounds three ounces and a quarter averdupois of water: and the gallon for corn, meal, &c. 272¼ cubic inches, and holds nine pounds thirteen ounces of pure water.

GALLOON, in commerce, a thick, narrow kind of ferret, ribband, or lace, used to edge or border clothes.

To GA'LLOP. *v. n.* (*galoper*, French.) 1. To move forward by leaps, so that all the feet are off the ground at once (*Donne*). 2. To ride at the pace which is performed by leaps (*Sidney*). 3. To move very fast (*Shakspeare*).

GALLOP, a well known pace to which the horse is trained, and of which many kinds are enumerated, but two only worthy of regard, to wit, the hand gallop, and the full gallop. Even these distinctions, however, are founded on the different degrees of velocity in which the animal is impelled, rather than on any peculiarity in the pace itself. In the galloping, the horse leads with one fore-leg somewhat advanced, but not so much beyond the other as happens in the canter (see CANTER); and, when he is urged to his utmost speed, his legs are almost equally placed. The fleetest horses, when galloping, carry their bodies perfectly in a horizontal posture, and the fewer curves or successive arches are described, the more rapid of course is their progress.

In every instance of progression, all bodies are retarded in proportion as they depart from a right line, whether this be horizontally or perpendicularly. "None but horses of great powers," says an excellent veterinarian "are able to gallop in this form; for, to supply the want of undulation in the body, they must bend their limbs in a greater degree; and hence the necessity of their standing perfectly on the centre of gravity. The action of the gallop being more extended than the canter, it is necessary that the horse should have his head more at liberty; for a horse cannot gallop out with his head reined up. Thus, in the swift gallop, he carries his head and neck nearly horizontal."

We are no less ready to agree with that writer on the common practice of grooms and jockeys, who teach horses to pull against them in performing the gallop. To this they are led by the support it affords them when they stand upright in the stirrups; but the bad effects of constant pressure, in deadening the horse's mouth, by rendering it callous, are sufficient to demonstrate the pernicious tendency of this custom. "When the horse thus bears on the hand," says the same writer, "a considerable portion of the power which should be concentred in his body, for the purpose of maintaining his equilibrium, is directed forwards; and hence he becomes much more liable to fall, in case of meeting with any casual obstacle." The power which the rider has, in this case, must be exactly in proportion to the degree of sensibility with which the horse's mouth is endued; and when this is rendered inconsiderable by the hardness of the parts, it is not surprising if accidents happen, and the animal is unruly.

In his account of the proportions of Eclipse, Mr. St. Bel has exhibited six complete actions of the gallop of that celebrated racer, each action covering twenty-five feet. The six, taken together, offer a scale of one hundred and fifty feet.

The same writer describes the gallop as consisting of "a repetition of bounds or leaps, more or less high, and more or less extended, in proportion to the strength and lightness of the animal."

"The common gallop," he says, "contains three times. If the horse, for example, begin his gallop on the right, the left hind-foot beats the first time; the right hind-foot and left fore-foot beat the second time together; and the right fore-foot beats the third.

"In the gallop of four times, the feet strike the ground in the same order as in walking. Supposing the horse galloping on the right, the left hind-foot beats the first time, the right hind-foot beats the second, the left fore-foot beats the third, and the right fore-foot beats the fourth. This gallop is regular, but confined, and but little adapted for speed.

"The gallop at two times is faster than at three or at four; the legs follow in the same order as in the trot, so that the two sounds are given by the left hind-foot and right fore-foot striking the ground together, and by the right hind-foot and left fore-foot also striking the ground together."

In galloping, the horse may lead with which fore-leg he pleases; the most usual way is that with the right: but, whichsoever it be, the hind-leg of the same side must follow next; otherwise the legs are said to be disunited, and the gallop to be false. To remedy this disorder, the rider must stay the horse a little on the

hand, and help him with the spur a little on the contrary side to that on which he is disunited. As, for example, if he be disunited on the right side, he should help him with the left spur, by staying him as before on the hand a little, and also helping him at the same time with the calves of the legs.

In a circle, the horse is confined always to lead with his fore leg within the turn, otherwise he is said to gallop false; but here too the hind leg of the same side must follow.

Those who make trial of the gallop should observe if the horse performs it equally, and should push him on somewhat hard, that they may know by his stop whether he has strength and vigour, and if he also be sensible of the spur.

In the manage many varieties of this pace were formerly enumerated, but these are not worth detailing.

GALLOPADE, in the manage, a hand-gallop, in which a horse galloping upon one or two treads is well united. The difference between working with one haunch in, galloping upon volts, and managing upon *terra a terra*, is, that, in the latter, the two haunches are kept subject, and also are within the volt; but, in galloping a haunch in, only one is kept subject.

To gallop united, upon the right foot, is, when a horse that gallops out, having led with either of his fore-legs, continues to lift that same leg always first; so that the hinder leg on the side of the leading fore-leg must likewise be raised sooner than the other hind-leg. For instance, if the right fore-leg leads before the left, then the right hind-leg must likewise move sooner than the left hind-leg; and in this order must the horse continue to go on.

To gallop false, to disunite, to gallop on the false foot, is, when the horse, having led with one of the fore-legs, whether the right or left, does not continue to make that leg always set out first, nor to make the hind-leg of the same side with the leading leg to move before its opposite hind-leg; that is to say, the orderly going is interrupted.

A horse that gallops false, gallops with an unbecoming air, and incommodes the rider. If the horse gallop false, put him upon keeping the right foot and uniting, by bringing him to with the calves of your legs, and then with the spur that is opposite to the side on which he disunites. If he disunite to the right, prick him with the left heel.

GA'LLOPER. *s.* (from *gallop.*) 1. A horse that gallops (*Mortimer*). 2. A man that rides fast, or makes great haste.

To GA'LLOW. *v. a.* (agælpan, to fright, Saxon.) 1. To terrify; to fright (*Shakspeare*).

GA'LLOWAY. *s.* A horse not more than fourteen hands high, much used in the north.

GALLOWAY (New), a borough of Kirkcudbrightshire, situate on the river Ken, 14 miles N. of Kirkcudbright.

GALLOWAY (Upper). See WIGTONSHIRE.

GALLOWAY (Mull of), one of the western islands of Scotland, about 24 Scotch miles long, and as much in breadth. It is in general rocky and barren, not producing a sufficient quantity of corn for the inhabitants; but about 1800 head of cattle are annually exported.

GALLOWS, an instrument of punishment, whereon persons convicted capitally of felony, &c. are executed by hanging. Among our ancestors it was called *furca*, fork; a name by which it is still denominated abroad, particularly in France and Italy. In this latter country, the reason of the name still subsists; the gallows being a real fork driven into the ground, across the legs whereof is laid a beam, to which the rope is tied.

GALLUS (Cornelius), an ancient Roman poet, was born at Frejus, then called Forum Julium. Augustus gave him the government of Egypt, after the death of Antony and Cleopatra; but afterwards deprived him of his estate, and banished him for mal-administration. He felt his disgrace so sensibly that he put an end to his life A.D. 26. Virgil's 10th eclogue is written wholly on the love of Gallus for Lycoris, which was the poetical name of his mistress, who was unfaithful to him.

GALLUS (Vibius), a Roman emperor, was born about the year 206. He had been consul, and had a command in the army of the emperor Decius, whom he is said to have betrayed to the Goths that he might succeed him. His reign was inglorious; and he was slain in 253 by his soldiery, together with his son Volusianus, whom he had associated in the empire.

GALLUS (Flavius Claudius Constantius), brother of the emperor Julian, was created Cæsar in 331, by the emperor Constantius, his cousin. He acquired reputation in war; but afterwards abandoned himself to the counsels of his wife, who was cruel and avaricious. He was arrested by the orders of Constantius; and beheaded in 354.

GALLUS, in fabulous history, a youth who was a great favourite of Mars, who always took him along with him when he went to visit Venus in private, in order that he might keep watch to prevent their being surprised; but Gallus falling asleep, and they being discovered by Vulcan, who entangled them in a net, Mars was so greatly enraged, that he metamorphosed Gallus into a cock; and therefore, to atone for this neglect, he gives constant notice of the sun's approach by his crowing.

GALLUS, or COCK, in ornithology. See PHASIANUS.

GALLY, in printing, a frame into which the compositor empties the lines out of his composing-stick, and in which he ties up the page when it is completed. The gally is formed of an oblong square board, with a ledge on three sides, and a groove to admit a false bottom called a gally-slice.

GALOPINA, in botany, a genus of the class tetrandria, order digynia. Calyxless; corol four-cleft, superior; berry two-celled, seeds solitary. One species; a Cape plant; with red, herbaceous stem, and terminal panicled flowers.

GALVANI (Lewis), a modern physiologist, who has had the honour of giving his name to a supposed new principle in nature, was born in 1737, at Bologna, where several of his relations had distinguished themselves in jurisprudence and theology. From his early youth he was much disposed to the greatest austerities of the Catholic religion, and particularly frequented a convent, the monks of which attached themselves to the solemn duty of visiting the dying. He shewed an inclination to enter into this order, but was diverted from it by one of the fraternity. Thenceforth he devoted himself to the study of medicine in its different branches. His masters were the doctors Beccari, Jacconi, Galli, and especially the professor Galeazzi, who received him into his house, and gave him his daughter in marriage. In 1762, he sustained with reputation an inaugural thesis De Ossibus, and was then created public lecturer in the university of Bologna, and appointed reader in anatomy to the institute in that city. His excellent method of lecturing drew a crowd of auditors; and he employed his leisure in experiments and in the study of comparative anatomy. He made a number of curious observations on the urinary organs, and on the organ of hearing in birds, which were published in the Memoirs of the Institute. His reputation, as an anatomist and physiologist, was established in the schools of Italy, when accident gave birth to the discovery which has immortalised his name. His beloved wife, with whom he lived many years in the tenderest union, was at this time in a declining state of health. As a restorative, she made use of a soup of frogs: and some of these animals, skinned for the purpose, happened to lie upon a table in her husband's laboratory, upon which was placed an electrical machine. One of the assistants in his experiments chanced carelessly to bring the point of a scalpel near the crural nerves of a frog, lying not far from the conductor. Instantly the muscles of the limb were agitated with strong convulsions. Madame Galvani, a woman of quick understanding, and a scientific turn, was present, and, struck with the phænomenon, she immediately went to inform her husband of it. He came and repeated the experiment; and soon found that the convulsion only took place when a spark was drawn from the conductor, at the time the scalpel was in contact with the nerve.

In conjunction with these enquiries, his duties as a professor, and his employment as a surgeon and accoucheur, in which branches he was very eminent, gave full occupation to his industry. He drew up various memoirs upon professional topics, which have remained inedited; and regularly held learned conversations with a few literary friends, in which new works were read and commented upon. He was a man of an amiable character in private life, and possessed of great sensibility, which he had the misfortune of being called to display on the death of his wife in 1790; an event which threw him into a profound melancholy. He rarely suffered a day to pass without visiting her tomb in the nunnery of St. Catherine, and pouring out his prayers and lamentations over her remains. He was always, indeed, punctual in practising the minutest rites of his religion, the early strong impressions of which never left him, and his attachment to religion was probably the cause of steadily refusing to take the civic oath exacted by the new constitution of the Cisalpine Republic, in consequence of which he incurred the deprivation of his posts and dignities. A prey to melancholy and reduced nearly to indigence, he retired to the house of his brother James, a man of very respectable character, and there fell into a state of languor and almost imbecility. The republican governors, probably ashamed of their conduct towards such a man, passed a decree for his restoration to his professional chair and its emoluments; but it was then too late. He died on November 5th, 1798, at the age of 61. (*British Encyclo.*)

GALVANISM, the name by which a particular department of physical science has been till lately called; see Voltaism, under which name this branch of science is now more generally described in the philosophical societies of Europe.

GAMA (Vasco de), a Portuguese admiral, celebrated for his discovery of the East Indies by the Cape of Good Hope, was born at Synes, and in 1497 was sent to the Indies by king Emanuel: he returned in 1502, and sailed thither again with 13 vessels richly laden. He was made viceroy of the Indies by king John III.; and died at Cochin on the 24th of December, 1525. Don Stephen and Don Christopher de Gama, his sons, were also viceroys of the Indies, and celebrated in history.

GAMANDRA. See Gamboge.

GAMBADE, or Gambado. (from *gamba*, Italian.) A sort of leather boot fixed to a saddle, instead of stirrups to put the legs in.

GAMBET, in ornithology. See Tringa.

GAMBIA, a great river of Negroland, in Africa. It is navigable for sloops above 600 miles; and, after running from E. to W. it falls into the Atlantic ocean. This river overflows annually, like the Nile in Egypt, at the same time, and from the same cause, viz. the heavy rains which fall periodically in the inland parts of Africa.

GAMBIENSE GUMMI. See Thino.

GAMBIST, a musical performer on the viol di gamba.

GA'MBLER. *s.* (A cant word, perhaps from *game.*) A person who draws in the unweary to game, in order to cheat them.

GAMBOGE. Gambogium. Gummi gutta. Cambogia gutta. Gamandra. The resinous gum produced by wounding the bark of an East Indian tree, which by some writers is described under the name of stalagmitis, but is more generally regarded as a species of garcinia. (See Garcinia cambogia.) When pure its colour is a deep rather dull orange; its fracture is conchoidal, and somewhat shining. It has no smell, and very little taste; but when kept in the mouth for some time gives a slight

impression of acrimony. If applied to the flame of a candle, it melts and blazes, throwing out sparks, and emitting a dense black smoke.

Gamboge is not soluble, though extremely diffusible in water, with which it forms an opake yellow-coloured infusion; by passing the liquor through a filter some resin is detained, but the fluid still continues coloured and turbid. Alkohol proves a more effectual solvent, taking up the gamboge in large quantities, and forming a clear gold-coloured fluid. Both the fixed alkalies and ammonia effect almost a total solution of gamboge, producing a clear liquor of a deep and rich red brown colour, and the residuum, being pure gum, is entirely soluble in water. The addition of an acid to the alkaline solution throws down a copious yellow precipitate, which, when dried, presents an earthy fracture, is difficultly combustible, and does not smell like the pure resin.

In medicine gamboge is generally employed as a drastic purgative, and, after having been long obsolete in practice, is again brought forwards in the new pharmacopœia of the London college, in the form of pills. (See PHARMACY.) It may be found useful in obstinate constipations of the bowels, hydropical affections, and worm cases produced by the tænia visceralis or tape-worm.

Besides its medical application, gamboge is extensively used as a water colour, and its tincture in alkohol is one of the ingredients of the gold-coloured lacquer with which most of the smaller articles that are made of brass are overlaid: it is also employed by the inlayer and cabinet-maker to stain white woods in imitation of box, &c.

GA'MBOL. *s.* (from the verb.) 1. A skip; a hop; a leap for joy (*L'Estrange*). 2. A frolic; a wild prank (*Hudibras*).

GA'MBREL. *s.* (from *gamba*, Italian.) The leg of a horse (*Grew*).

GAME. *s.* (*gaman*, a jest, Islandick.) 1. Sport of any kind (*Shakspeare*). 2. Jest; opposed to earnest or seriousness (*Spenser*). 3. Insolent merriment; sportive insult (*Milton*). 4. A single match at play. 5. Advantage in play (*Dryden*). 6. Scheme pursued; measures planned (*Temple*). 7. Field sports: as, the chase (*Waller*). 8. Animals pursued in the field (*Prior*). 9. Solemn contests, exhibited as spectacles to the people (*Denham*).

To GAME. *v. n.* (ʒaman, Saxon.) 1. To play at any sport. 2. To play wantonly and extravagantly for money (*Locke*).

GAME, in general, signifies any diversion or sport that is performed with regularity and restrained to certain rules. (See GAMING.) Games are usually distinguished into those of exercise and address, and those of hazard. To the first belong chess, tennis, billiards, &c. and to the latter those performed with cards or dice, as back-gammon, ombre, picquet, whist, &c. See BACK-GAMMON, &c.

GAMES, in antiquity, were public diversions exhibited on solemn occasions. Such, among the Greeks, were the Olympic, Pythian, Isthmian, Nemean, &c. games; and, among the Romans, the Apollinarian, Circensian, Capitoline, &c. games. See OLYMPIC, PYTHIAN, FUNERAL, &c.

GAME, for the preservation of which such a succession of laws have been enacted, were, in many of the preambles to former acts of parliament, extended among birds to the heron, pigeon, mallard, duck, teal, widgeon, and various other fowls; but in the present contemplation of law and practice, game is generally limited to the hare, pheasant, partridge, heath-fowl, and moor-game, which are the whole embraced by the game laws; and that persons possessed of due qualifications, as well as of annual certificates, are empowered to kill. Deer of every description are also denominated game; but they are protected by appropriate laws. Rabbits were also included in many of the earliest acts relating to game, but are now regarded of no consequence, except in warrens, where, being private property, and productive of annual profit, they are protected by laws for the security of the owner, with very heavy penalties annexed to their destruction. Proprietors of dove-house pigeons have likewise legal means of redress, upon their pigeons being wantonly shot at or destroyed. The mallard, wild duck, widgeon, teal, &c. are not without laws for their increase and proportional preservation; but they do not, in the technical language of the day, come under the designation of game. For these last, see the article DECOY.

GAME COCK, a variety of the phasianus gallus, almost peculiar to this country, whose natural and instinctive courage will never permit him to yield to an opponent, however superior in weight and strength; continuing, even under those disadvantages, to fight till literally cut to pieces. After the loss of eyes, with the body wounded in every part, when even the use of his legs are gone, and he is no longer able to stand, but lies extended upon the sod, with his victorious opponent exultingly crowing over his mangled frame, he will continue to show fight with his beak to the last remains of life.

Game cocks are bred of various colours, according to the fancy or opinion of different amateurs: of these colours, the chief are the following: The black or pheasant-breasted red; the black-breasted ginger; the speckle-breasted ginger dun; the black-breasted yellow duckwing; the turkey-breasted duckwing; the smutty dun; the brass-winged black; and the smock, which is a milk-white, having the appearance of a common barn-door fowl; in consequence of which there are generally odds offered against this last whenever brought to pit, which is now but seldom, the breed being nearly or quite destroyed.

It is an opinion nearly unanimous, that if you breed entirely for the pit, no cock selected for this purpose should be younger than two, or older than six years; and although it is right to breed from a strong, bony, close-made, majestic, high-standing cock, it is by no means prudent so to do from cocks much above match weight; that is to say, never to exceed four pounds, twelve ounces, at the utmost; for should the hens prove large also, the progeny might run still more into size and bone, and never fall into any match whatever.

In breeding game chickens, to attain success, the following general rules should be strictly attended to. No brood-cock should walk with more than four hens; three being, in fact, fully suffici-

ent. Game hens should never be permitted to bring forth a clutch of chickens before the last week in February, nor after the first week in May; those alone which are hatched in March and April should be chosen for the pit, as being preferable, in size and growth, to those hatched at any other season of the year. Hens after hatching should be cooped asunder, where the chickens cannot intermix; as the hens will not only kill the young of each other, but fight themselves with the same inveteracy as the cocks. If a game hen, with chicken, retreats when attacked by another in the same state her produce may be suspected to prove defective in courage; but perhaps this opinion is not founded on fact; for the younger will always yield to the older whatever her native courage.

During the first year after being hatched the brood are called chickens; from twelve months to two years old stags, and at that period cocks, being then judged in their prime; but they are probably more so at three, if properly walked. Cock chickens should never be permitted to run too long together, but may be separated as soon as they begin to fight with each other; and this ought to be the more strictly attended to, because it frequently happens, that out of a whole clutch, by neglect or inattention, in consequence of scalped heads, loss of eyes, broken beaks, or deformed feet, not one will remain capable of being brought to the scale.

Cock chickens, when first removed, at three or four months old, are placed where they continue to walk under an old cock, and will remain submissive till nine and ten, or sometimes twelve months old; the experiment is nevertheless too hazardous; and they had much better be taken to a master-walk at an earlier period, to avoid the probability of being spoiled. The most eminent breeders, as well as the most enthusiastic betters, have one mode of endeavouring to fix a criterion, how far they can depend upon the heel, the fight, and the blood, of any particular breed or cross they may have been induced to adopt. This experiment (dreadfully cruel as it is) is termed cutting out, and consists in pitting such chicken of seven, eight, and nine months old, unarmed, against their own brothers, or others of superior age, weight, and strength, having silver spurs; if the chicken, so unarmed, and without the least chance of success, continues the combat till completely deprived of life, without displaying the least tendency to cowardice, or consciousness of defeat, more of his brothers have the same severe and fiery ordeal to undergo, when, if the result is just the same, the cross is admitted to be good, and the breed is persevered in, till, from other circumstances, the blood is suspected to degenerate, when new crosses are adopted, and new experiments made. See COCKING, COCK-MATCH, and COCKPIT.

GAMEKEEPERS, are persons delegated to provide game for those by whom they are appointed, to preserve and protect it against poachers by night, and unqualified sportsmen by day, and also against any unfair or improper destruction of it. Every lord or lady of a manor is authorised, by writing under their hands and seals, upon a 30s. stamp, to empower a game-keeper to kill within the said manor any hare, pheasant, partridge, or other game; and if such game-keeper shall sell or dispose of the game he shall so kill, without the knowledge or consent of the said lord or lady, and shall be convicted, upon the oath of one witness, before a justice of peace, he shall be committed to the house of correction, and kept to hard labour for three months; or he may be fined in a penalty of 5l. in like manner as higglers and others who sell game

By 48 Geo. 3. c. 93. The lord or lady of any manor may appoint any person whatever, whether acting as a gamekeeper to any other person or not, or whether retained and paid for as the male servant of any other person or not, or whether a qualified person or not, to be a gamekeeper to such manor, with authority to kill game within the same for his own use, or for the use of any other person whatever, to be specified in such appointment, whether qualified or not; and no person so appointed gamekeeper shall be deemed or taken to be, or entered or paid for as the gamekeeper, or male servant of the lord or lady making such appointment.

And any person appointed gamekeeper under this act to kill game for his own use, or the use of any other person, shall have the same power as if he had been legally qualified to act as gamekeeper, to kill game for the use of the lord or lady of the manor.

One gamekeeper only can be appointed to kill game within one manor; and by virtue of his office or deputation, he is empowered to take and seize all guns, bows, greyhounds, setting-dogs, lurchers and ferrets; all trammels, low-bells, hays, or other nets, hare-pipes, snares, or other engines, for the taking and killing of hares, pheasants, partridges, or other game, within the precincts of such manor, in the possession of any person not qualified to keep the same. But it does not appear by the act (23d Charles II. c. 25. s. 2.) that a gamekeeper is empowered to seize the game, although he is authorised to take all instruments in use for the destruction of it.

A gamekeeper having no other qualification than his deputation and certificate, is not entitled to kill game out of the precincts of the manor for which he is appointed. Nor is he empowered to demand the name, or a sight, of the certificate of any qualified person out of his own district, unless he is qualified to kill game in his own right, (exclusive of his deputation,) and is possessed of his three-guinea certificate obtained in virtue of his own right to kill, as well as his guinea-certificate on account of his deputation; in which case he may do either or both. But although he is qualified to kill game in his own right, and acts under a deputation for a certain specified manor, he is liable to the penalty prescribed by the act, if he be informed against for, and convicted of, killing game out of that manor, without being previously possessed of the three-guinea certificate.

GAME-LAWS: laws framed for the preservation of game, by different acts of the legislature and in different periods of its history, and now become, in no small degree, voluminous and perplext. The following is a summary of the chief.

Persons held legally qualified to kill game, must be in the full and undisputed possession of a freehold landed estate, producing a clear 100l. per annum; or possessed of a lease, or leases, for ninety-nine years, or any longer term, of the clear yearly value of 150l., or else the heir apparent of an esquire, or other person of higher degree, 22 and 23 Car. 2. c. 25. But esquires, as defined by law, are the younger sons of noblemen, and their heirs male for ever: the four esquires of the king's body: the eldest sons of baronets, of knights of the bath, of knights bachelors, and their heirs male in the right line. A justice of the peace is also an

esquire for the time he is in the commission, but no longer.

Persons of higher degree than esquires are colonels, serjeants at law, and doctors in the three learned professions; but neither esquires, nor any of these, are qualified to kill game, unless they have the requisite estate mentioned; though their sons are qualified without any estate. This, however unreasonable it may seem, has been fully decided to be the true construction of the act. But in addition to every necessary qualification either by deputation or estate, according to the construction of all former acts, certain duties are chargeable under the last assessed tax act (48 Geo. 3. c. 55. sched. L.) upon every person who shall use any dog, gun, net, or other engine, for the purpose of killing any game whatever, or any woodcock, snipe, quail, or landrail, or any conies, in any part of Great Britain, that is to say:

If such person shall be a servant to any person duly charged in respect of such servant to the duties granted on servants, and shall use any dog, gun, net, or other engine, for any of the purposes before mentioned, upon any manor or royalty, by virtue of any deputation or appointment, as gamekeeper thereto, there shall be charged the annual sum of - - - £. 1 1 0

And if such person shall not be a servant for whom the said duties on servants shall be charged, there shall be charged the annual sum of 3 3 0

Upon every other person who shall use any dog, gun, net, or other engine, for any of the purposes before mentioned, there shall be charged the annual sum of - - - - - 3 3 0

The taking of woodcocks and snipes with nets or springs; or, the taking of conies in warrens, or inclosed ground, or by any person on lands in his own occupation, does not make the party liable to either of the above duties. The party is to pay the duty annually to the collectors of the parish, together with one shilling over and above the duty, and obtain a certificate thereof, which certificate shall continue in force till April 5 following.

The parochial collector is to give to the party a receipt for the duty on unstamped paper; which, being delivered to the clerk of the commissioners for the district, shall be exchanged for a certificate from the said clerk, gratis.

Neither the payment of this duty, nor the certificate delivered, shall authorise any person to use any dog, gun, net, or other engine, at any times or in any manner prohibited by law, nor unless such person shall be duly qualified so to do. Nor shall any assessment or certificate under a deputation be received in evidence, where proof shall be given of the party's having acted out of the limits of the manor.

If any person shall be found using any dog, gun, net, or other engine, by an assessor or collector, or by any commissioner of assessed taxes, or by any lord, or gamekeeper of the manor, or by any inspector, or surveyor of taxes, or by any person duly assessed to the duties, or by the owner, landlord, lessee, or occupier of the land, they may demand the production of his certificate; and if such person shall, after such demand, refuse to produce a certificate, or, in default thereof, to give in to the person demanding the same his christian and surname, and place of residence, and the parish (if any) in which he shall have been assessed, or shall produce any false certificate, or give any false name, place of residence, or place of assessment, such person shall forfeit 20l.

The commissioners of taxes shall once, or often er, in every year, cause the names and residences of the persons certificated, to be inserted in some newspaper circulating in each county.

And if any person shall use any dog, gun, net, or other engine, without having obtained such certificate, such person shall be liable to the duty of 3l. 3s. and also shall forfeit 20l. over and above the duty; the said duty to be assessed by way of surcharge.

Restrictions as to the time of killing game are as follow: no partridge to be killed between the 1st of February and 1st of September, under a penalty of five pounds. No pheasant between the 1st of February and 1st of October, under the like penalty. No grouse, or red game, between December 10th and August 12th. No heath fowl, or black game, between December 10th and August 20th. No bustards between March 1st and September 1st. No time is limited for the killing hares, provided they be legally taken. No game whatever is to be killed or taken between seven at night and six in the morning, from 12th February to 12th October, and between nine at night and four in the morning the rest of the year, nor on a Sunday or Christmas-day, upon pain for the first offence to forfeit not less than 10l. nor more than 20l. and for the second offence not less than 20l. nor more than 30l. for any other offence to be committed till the next general quarter sessions, or bound over as well as the informer; and if convicted to pay 50l. and be committed till payment, but not for less than six months nor more than twelve, and to be whipped at the end of imprisonment: but not to be proceeded against without information on oath within a month.

And persons to the number of two or more found in any forest, chose, park, wood, plantation, paddock, field, meadow, or other open or inclosed ground, in the night between eight and six, from 1st October to 1st February, or between ten and four, from 1st February to 1st October, having one gun or engine, with intent to kill or take game, or persons aiding with offensive weapons, may be apprehended, and, on conviction before a justice, shall be deemed rogues and vagabonds.

Any unqualified person exposing a hare, pheasant, partridge, or other game to sale, is liable to a penalty of 5l. For selling a hare, pheasant, partridge, or other game, qualified or unqualified, 5l. If either be found in the shop, house, or possession of any poulterer, salesman, fishmonger, cook or pastry-cook, or of any person not qualified in his own right to kill game, or not entitled thereto under some person so qualified, it shall be deemed an exposing of the same to sale.

The words of the stat. 5 Ann. c. 14. whereby unqualified persons using any engine to kill or destroy hares, pheasants, partridges, or other game, are liable to a penalty of 5l. as well as for keeping and using greyhounds or setting-dogs, are in the disjunctive, viz. keep or use any greyhounds, setting-dogs, hays, lurchers, or any other engines to kill and destroy the game: the offences are therefore distinct and several, and a conviction either for the keeping or for the using any of the dogs of the kinds enumerated will be good. The penalties against the game-laws may be recovered either by a summary conviction before one justice, or by action in any court of record at Westminster, brought within six lunar months. The whole penalty to be given to the informer, with double costs. Informations before justices of the peace must likewise be laid within six months, and on a summary conviction, thence half the penalty is to the informer, and half to the poor.

A qualified person cannot enter upon another man's ground to kill game, without being liable to an action for trespass; but if the party be qualified to kill game, and an action be brought for the trespass, if the damages recovered be under 40s. he shall in such case pay no more costs. However, if the owner or occupier of the land expressly forewarns another not to come or hunt thereon, and, notwithstanding such warning, he does, this is a wilful trespass: and if an action be brought for the same, he will be liable, whether qualified or not, to pay full costs, although the damages recovered may be under 40s. However, any unqualified person may go out to beat hedges, bushes, and mark birds, in company with a qualified person, or to see the game pursued and taken, without being liable to any penalty, provided he have no dog, gun, or engine, of his own, to assist in its destruction.

GAMELIA, a sacrifice held in the ancient Greek families, on the day before a marriage.

GAMELION, in ancient chronology, the 8th month of the Athenian year. It contained 29 days, and answered to part of our January and February.

GA'MESOME. *a.* (from *game.*) Frolicsome; gay; sportive (*Sidney*).

GA'MESOMELY. *ad.* merrily.

GA'MESOMENESS *s.* (from *gamesome.*) Sportiveness; merriment.

GA'MESTER. *s.* (from *game.*) 1. One who is vitiously addicted to play (*Shakspeare*). 2. One who is engaged at play (*Bacon*). 3. A merry frolicksome person (*Shakspeare*). 4. A prostitute: not in use (*Shak.*).

GAMING, the art of playing or practising any game, particularly those of hazard, as cards, dice, tables, &c.

It appears that by the ancient common law, all games were lawful. But so early as the reign of Richard II. the legislature found it necessary to interfere, and to make several games illegal. This was levelled at labourers and artificers. The next statute was the 2d Hen. IV. which inflicted six days imprisonment on those who offended against the act of Rich. II. The 17th Edw. IV. imposes a penalty of two years imprisonment on those who offended against the act of Richard II. The 17th Edw. IV. imposes a penalty of two years imprisonment and a fine against various games there enumerated, and by the 11th Hen. VII. labourers and artificers are prohibited from playing at unlawful games, but in Christmas only. The principal object of these early statutes was, to encourage archery, and to make that the only lawful sport for the lower ranks of the people. But the earliest act against gaming now in force is the 33d Henry VIII. which gives justices of peace and head officers in corporations a power to enter all houses suspected of unlawful games, and to arrest the gamesters till they give security [illegible] person by deceit, or unlawful device, in playing either at cards or dice, tables, bowls, cock-fighting, horse-races, foot-races, &c. or bearing a share in the stakes or betting, shall win any money or valuable thing of another, he shall forfeit treble the value thereof: likewise if any person shall play at any of the said games upon tick, and not for ready money, and lose the sum of 100l. on credit, at one meeting, if the money is not paid down, his security taken for it shall be void, and the winner becomes liable to a forfeiture of treble value of such money won. 16 Car. II. c. 7. Not only all notes, bills, bonds, mortgages, or other securities given for money won at gaming, are declared void; but also where lands are granted, they shall go to the next person entitled, after the decease of the person so encumbering the same. Persons losing by gaming at one time 10l. may recover the money lost from the winner, by an action of debt brought within three months; and on the loser's not prosecuting, any other may lawfully do it, and recover treble the value, with costs. 9 Anne, c. 14. Those who cheat at cards, dice, &c. besides their forfeitures, have inflicted on them such infamy and corporal punishment, as in cases of perjury; and beating, or challenging any other person to fight, on account of money won by gaming, shall forfeit all their goods, and be imprisoned two years: and where persons play that have no visible estates, and do not make it appear that the principal part of their maintenance is got by other means than gaming, they may be bound to their good behaviour by two justices of the peace, &c. Stat. ibid. See 2 Geo. II. c. 28. The ace of hearts, pharaoh, basset, &c. are judged to be lotteries by cards or dice; and persons who set up those games are subject to 200l. penalty. And every adventurer, who shall play, stake, or punt at them, forfeits 50l. Also any sales of houses, goods, plate, &c. in such a way, are void, and the things forfeited to any who will sue for the same. 12 Geo. II. c. 28. See Disney's Laws of Gaming, Wagers, &c.

GAMING (Mathematical laws of). The business of chance or hazard, on which the laws of gaming depend, is of mathematical consideration; inasmuch as it admits of more and less. It is, or is supposed to be, an equality of chance, upon which the gamesters set out: this equality is to be broken in upon in the course of the game, by the greater good fortune or address of one of the parties, upon which he comes to have a better chance; so that his share in the deposit, or stakes, is now proportionably more or better than at first; this more and less is continually varying, and runs through all the ratios between equality and infinite difference; or from an infinitely little difference till it arrives at an infinitely great one, upon which the game is ended. The whole game, therefore, with respect to the event or issue thereof, is only a change of the quantity of each person's share, or chance, or of the proportion their two shares bear to each other; which mathematics alone can measure.

Hence several authors have computed the variety of chance in several cases and circumstances that occur in gaming; particularly M. de Moivre, in a Treatise entitled The Doctrine of Chances, the best edition being published in 1756; of which we shall here give the reader an abstract. See also CHANCE.

1. *To find the probability of throwing an ace in two throws of one die.* The first part of the probability required is that of throwing an ace at the first throw, which is $\frac{1}{6}$; but, as the probability of missing it in this throw is $\frac{5}{6}$, and that of throwing it in the second is $\frac{1}{6}$, the second part of the

probability required, being the product of both these, will be $\frac{5}{6} \times \frac{1}{6} = \frac{5}{36}$; and therefore the whole probability is $\frac{1}{6} + \frac{5}{36} = \frac{11}{36}$.

2. *To find the probability of throwing an ace in three throws.* The probability of throwing it in the first throw is $\frac{1}{6}$; and the probability of missing it is $\frac{5}{6}$, which being multiplied by $\frac{11}{36}$, the probability of throwing it in the two remaining times by Case 1, will give $\frac{5}{6} \times \frac{11}{36} = \frac{55}{216}$ for the second part of the probability required; and therefore the whole probability will be $\frac{1}{6} + \frac{55}{216} = \frac{91}{216}$.

3. *To find the probability of throwing an ace in four throws.* This is evidently, by the preceding cases, $\frac{1}{6} + \left(\frac{5}{6} \times \frac{91}{216} = \right)\frac{455}{1296} = \frac{671}{1296}$; and the probability of the contrary is $\frac{625}{1296}$, because $\frac{671}{1296} + \frac{625}{1296} = \frac{1296}{1296} = 1$, which denotes certainty.

4. *To find the probability of throwing two aces in two throws.* The probability required is $\frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$, the events in this case being independent. See Expectation.

5. *To find the probability of throwing two aces in three throws.* The probability of throwing an ace in the first throw, is $\frac{1}{6}$, and the probability of throwing it once in the two remaining throws is $\frac{11}{36}$ by case 1: consequently the first part of the probability required is $\frac{1}{6} \times \frac{11}{36} = \frac{11}{216}$. But if the ace be missed the first time, the probability of which is $\frac{5}{6}$, there remains the probability of throwing it twice together, which is $= \frac{1}{36}$ by case 4; therefore the probability of both events is $\frac{5}{6} \times \frac{1}{36} = \frac{5}{216}$; and the whole probability required is $\frac{11+5}{216} = \frac{16}{216}$.

6. *To find the probability of throwing two aces in four throws.* The probability of throwing an ace the first time is $\frac{1}{6}$, and the probability of throwing it in three times is $\frac{91}{216}$ by Case 2: and the probability of both happening is $\frac{1}{6} \times \frac{91}{216} = \frac{91}{1296}$, the first part of the probability required. But the probability of missing the ace for the first time is $\frac{5}{6}$, and the remaining probability of throwing it twice in three throws is $\frac{16}{216}$ by case 5; therefore the probability of both together is $\frac{5}{6} \times \frac{16}{216} = \frac{80}{1296}$, the second part of the probability required; and, therefore, the whole probability is $= \frac{91}{1296} + \frac{80}{1296} = \frac{171}{1296}$.

In the same manner we may find the probability of throwing an ace as often as shall be demanded in any given number of throws.

From these familiar and more restricted cases, we may deduce a more general and comprehensive theorem. Let a be the number of chances for the happening of an event, and b the number of chances for its failing; then the probability of its happening *once* in any number of trials will be expressed by the series $\frac{a}{a+b} + \frac{ab}{(a+b)^2} + \frac{abb}{(a+b)^3} + \frac{ab^3}{(a+b)^4} + \frac{ab^4}{(a+b)^5}$, &c. continued till the number of terms be equal to the number of trials given: e. gr. let a be $= 1$, $b = 5$ and the number of trials given be $= 4$, the probability required will be expressed by $\frac{1}{6} + \frac{5}{36} + \frac{25}{216} + \frac{125}{1296} = \frac{671}{1296}$.

Again, the probability of the event's happening *twice* in any given number of trials will be expressed by the series $\frac{aa}{(a+b)^2} + \frac{2aab}{(a+b)^3} + \frac{3aabb}{(a+b)^4} + \frac{4aab^3}{(a+b)^5} + \frac{5aab^4}{(a+b)^6}$, &c. continued, till the number of terms, wanting one, be equal to the number of trials given: e. gr. let a be $=1$, $b=5$, and the number of trials be $=8$, the probability required will be expressed by $\frac{1}{36} + \frac{10}{216} + \frac{75}{1296} + \frac{500}{7776} + \frac{3125}{46656} + \frac{18750}{279936} + \frac{109375}{1679616} = \frac{663991}{1679616}$.

And the probability of the event's happening *thrice* in any given number of trials will be expressed by the series $\frac{a^3}{(a+b)^3} + \frac{3a^3b}{(a+b)^4} + \frac{6a^3b^2}{(a+b)^5} + \frac{10a^3b^3}{(a+b)^6} + \frac{15a^3b^4}{(a+b)^7}$, &c. continued, till the number of terms, wanting two, be equal to the number of terms given. These particular series may be comprehended under a general one in the following manner: let a and b be as before, and their sum $=a+b=s$; l the number of times which the event is required to happen in any given number of trials represented by n; then the probability of the event's happening l times in n trials will be expressed by the series $\frac{a^l}{s^l} + \left(1 + \frac{lb}{s} + \frac{l \cdot l+1 \cdot bb}{1 \cdot 2 \cdot ss} + \frac{l \cdot l+1 \cdot l+2 \cdot b^3}{1 \cdot 2 \cdot 3 \cdot s^3} + \frac{l \cdot l+1 \cdot l+2 \cdot l+3 \cdot b^4}{1 \cdot 2 \cdot 3 \cdot 4 s^4}, \&c\right)$ continued to as many terms, exclusive of the common multiplier $\frac{a^l}{s^l}$, as are denoted by the number

$n-l+1$. On the other hand, the probability of the event's not happening so often as l times, making $n-l+1=p$, will be expressed by the series $\frac{b^p}{s^p} \times \left(1+\frac{pa}{s}+\frac{p.\overline{p+1}.aa}{1.2.ss}+\frac{p.\overline{p+1}.\overline{p+2}\ a^3}{1.2.3.s^3}+\frac{p.\overline{p+1}.\overline{p+2}.\overline{p+3}.a^4}{}\ \&c.\right)$ continued to as many terms, exclusive of the common multiplier, as are denoted by the number l. The sum of these two probabilities is always equal to unity; and, therefore, the first series may be used when $n-l+1$ is less than l, and the second when l is less than $n-l+1$: in other words, the first or second may be used as l is less or greater than $\frac{n+1}{2}$. E. gr. let a be $=1$, $b=35$, $n=24$, and $l=1$: in this case twenty-four terms of the first series would be necessary to answer the question, but one term of the second will be sufficient; and the probability of an event's not happening *once* in twenty-four trials, which has one chance to happen, and thirty-five to fail, will be expressed by $\frac{35^{24}}{36^{24}} \times 1$: this quantity, by the help of logarithms, will be found nearly equal to the decimal 0.50871, which, subtracted from unity, leaves a remainder 0.49129, expressing the probability required; and, therefore, the odds against the happening of the event will be fifty to forty-nine nearly. Again, if $l=2$, $n=60$, and $n-l+1=59$, in this case fifty-nine terms of the first series will be necessary, and only two of the second; and, therefore, by the second series, the probability of an event's not happening *twice* in sixty trials will be $\frac{35^{59}}{36^{59}} \times \left(1+\frac{59}{36}\right)=0{,}5007$, which subtracted from 1, leaves the remainder 0.4993, expressing the probability required; consequently, the odds against the event's happening *twice* in sixty times will be little more than 500 to 499.

7. *To find the probability of throwing one ace, and no more, in four throws.* From the unlimited probability of the ace's being thrown in four throws, subtract the probability of its being thrown twice in that number of throws: i. e. from $\frac{671}{1296}$ by case 3. subtract $\frac{171}{1296}$ by case 6, and the remainder $\frac{500}{1296}$ gives the probability required, and $1-\frac{500}{1296}=\frac{796}{1296}$ the probability of the contrary; and the odds against throwing one ace, *and no more*, in four throws, are 796 to 500, or 8 to 5 nearly.

8. *If A and B play together, and A wants one game of being up, and B wants two, what are their respective probabilities of winning the set?* It is plain that A wants only to win once in two games, and B wants to win twice together; and if both have an equal chance, the probability which B has of winning the first game will be $\frac{1}{2}$, and the probability of his winning twice together will be $\frac{1}{2} \times \frac{1}{2}=\frac{1}{4}$; and, therefore, the probability which A has of winning once in two games will be $1-\frac{1}{4}=\frac{3}{4}$; consequently the odds of A's winning are three to one.

9. *If A and B play together, and A wants one game, and B wants two of being up; but the chances whereby B may win a game are double to those of A; to find the respective probabilities of winning.* In this case, the probability which B has of winning a game is $\frac{2}{3}$, and the probability of his winning twice together is $\frac{2}{3} \times \frac{2}{3}=\frac{4}{9}$; and, therefore, the probability of A's winning the set is $1-\frac{4}{9}=\frac{5}{9}$; and the odds of A's winning one before B wins twice, which the question requires, are as five to four.

In general, whatever be the number of games which A and B respectively want of being up, the set will be concluded at the most in so many games, wanting one, as is the sum of the games wanted between them. For if A wants three games, and B wants five of being up, the greatest number of games which A can win of B, before the determination of the play, will be two, and the greatest number which B can win of A will be four, and the whole number six: but, supposing they have played six games, the next game will terminate the play; and, therefore, the utmost number of games that can be played between them will be $7=5+3-1$.

10. *If A wants three games, and B wants seven of being up, and their respective chances of winning a game are as three to five; to find the respective probabilities of winning the set.* The sum of the games is ten, and the set will be concluded in nine games, and, therefore, A undertakes to win three out of nine games, and B to win seven; then, by the second series of the preceding theorem, n being $=9$, $l=3$, $a=3$, $b=5$, and $n-l+1$, or $p=7$, the probability which B has of winning the set will be expressed by $\frac{5^7}{8^7} \times \left(1+\frac{21}{8}+\frac{252}{64}\right)=\frac{5^7}{8^9} \times 484=0.28172$ nearly, which, subtracted from unity, leaves a remainder $=0.71828$, expressing the probability which A has of winning; consequently, the odds of A's winning the set will be 71828 to 28172, or nearly as 23 to 9.

Mr. de Moivre has also illustrated the principles of gaming, applied in the preceding cases, in a different and more general way, by supposing two dice, having the same or a different number of equal faces: it is obvious, that the number of all the variations which the two dice can undergo will be obtained by multiplying the number of faces of the one by the number of faces of the other. From hence it follows, that if the faces of each die are distinguished into white and black, and the number of white faces on the first is A, and that of the black faces B, and also the number of white and black faces on the second a and b respectively, the product of $A+B$ multiplied by $a+b$, i. e. $Aa+Ab+Ba+Bb$ will exhibit all the variations of the two dice: Aa will represent the number of all the chances whereby the two dice may exhibit two white faces; Ab the number of all the chances whereby a white face of the first may be joined with a black face of the second; aB the number of all the chances whereby a white face of the second may be joined with a black face of the first; and Bb the number of

all the chances whereby a black face of the first may be joined with a black face of the second. Moreover, as these several quantities may be connected together several ways, the sum of two or more of any of them will answer some question of chance: e. gr. the number of chances for throwing a white face with the two dice abovementioned, will be represented by the three parts $A\,a + A\,b + B\,a$, because every one of these comprehends a case wherein a white face is concerned: but if the question were restricted by a previous stipulation, that, if a person threw two white faces together, the wager would be lost, the two terms $A\,b + B\,a$ would represent all his chances. Farther, if a third die be added, whose white faces are α, and black faces β, the preceding product, viz. $A\,a + A\,b + B\,a + B\,b$, multiplied by the whole number of faces of the third die, viz. $\alpha + \beta$, or $A\,a\,\alpha + A\,b\,\alpha + B\,a\,\alpha + B\,b\,\alpha + A\,a\,\beta + A\,b\,\beta + B\,a\,\beta + B\,b\,\beta$, will exhibit the number of all the variations which the three dice can undergo: in this case $A\,a\,\alpha$ represents the number of chances for throwing three white faces, $A\,b\,\alpha$ the number of chances whereby both the first and third die may exhibit a white face, and the second a black one, &c. and by joining two or more of these terms, some question of chance will be answered; e. gr. the number of chances for throwing two white faces and a black one will be represented by $A\,b\,\alpha + B\,a\,\alpha + A\,a\,\beta$, and the odds in favour of him who undertakes to throw them will be $A\,b\,\alpha + B\,a\,\alpha + A\,a\,\beta$ to $A\,a\,\alpha + B\,b\,\alpha + A\,b\,\beta + B\,a\,\beta + B\,b\,\beta$; and the probability of the event will be expressed by a fraction, whose numerator is the number of chances required, and the denominator the whole number of variations which all the dice can undergo. E. gr. the probability of throwing three white faces with the three dice above-mentioned will be expressed by

$$A a\alpha + A b\alpha + B a\alpha \times A a\beta + B b\alpha + A b\beta + B a\beta + B b\beta,$$

or, separating the factors in the denominator,

$$\frac{A\,a\,\alpha}{(A+B) \times (a+b) \times (\alpha+\beta)} = \frac{A}{A+B} \times \frac{a}{a+b} \times \frac{\alpha}{\alpha+\beta}:$$

so that the probability of the happening of several events independently, is the product of all the particular probabilities whereby each particular event may be produced.

In the preceding case of two dice, if A be $= a$, and $B = b$, $A\,a + A\,b + a\,B + B\,b$ will become $= a\,a + 2\,a\,b + b\,b$; and $2\,a\,b = A\,b + a\,B$ will express the number of variations, whereby with two dice of the same respective number of white and black faces, a white face and a black one may be thrown. And in the case of three dice, $A\,b\,\alpha + B\,a\,\alpha + A\,a\,\beta$ will become $= 3\,a\,a\,b$; or, one term of the binomial $a+b$, raised to its cube, will express the number of variations, whereby three dice of the same kind would exhibit two white faces and a black one.

11. From the above reasoning the following general rule may be deduced: viz. in a number of dice $= n$, each of which is distinguished into white and black faces, represented respectively by a and b, if $a+b$ be raised to the power n, the first term of that power will express the number of chances whereby n white faces may be thrown; the second term will express the number of chances whereby $n-1$ white face and 1 black face may be thrown; the third term will express the number of chances whereby $n-2$ white faces and 2 black faces may be thrown, &c. and the respective numbers of white and black faces are represented by the indices of a and b in any given term.

To find the probability of throwing an ace in four throws with a common die of six faces. Since the throwing of one die four times successively is the same thing as throwing four dice at once, the chance of throwing an ace is the same in one case as in the other. Let the ace, then, in each of the four dice, answer to one white face, and the rest of the points to five black faces, or a be $= 1$, and $b = 5$; raise $a + b$ to its fourth power, and every one of the terms in $a^4 + 4\,a^3\,b + 6\,a^2\,b^2 + 4\,a\,b^3 + b^4$, that has an a, will be a part of the number of chances whereby an ace may be thrown: consequently, $a^4 + 4\,a^3\,b + 6\,a^2\,b^2 + 4\,a\,b^3$, i. e. $1 + 20 + 150 + 500 = 671$, will express the number of chances whereby an ace may be thrown with four dice, or in four successive throws of a single die; but the number of all the chances is the fourth power of $a+b$ or $6^4 = 1296$; and, therefore, the probability required is measured by the fraction $\frac{671}{1296}$. See Case 3. It is evident, that b^4, or the last term of the above power, expresses the number of chances whereby the ace may fail in every one of the dice; and the probability of that failing is $\frac{b^4}{(a+b)^4} = \frac{625}{1296}$, and, therefore, the probability of not failing, or of throwing an ace in four throws, is $1 - \frac{625}{1296} = \frac{671}{1296}$, as before. When the number of dice is n, b^n, the last term of the power $(a+b)^n$, will always represent the number of chances whereby the ace may fail in n times; and, therefore, $\frac{b^n}{(a+b)^n}$ is the probability of its failing; and the probability of throwing an ace, in a number of throws expressed by n, will be $1 - \frac{b^n}{(a+b)^n} = \frac{(a+b)^n - b^n}{(a+b)^n}$.

To find the probability of throwing with one single die two aces in four throws, or of throwing at once two aces with four dice. The three terms, $a^4 + 4\,a^3\,b + 6\,a^2\,b^2$ of the fourth power of the binomial $a+b$, in which the indices of a equal or exceed the number of times that the ace is to be thrown, will denote the number of chances whereby two aces may be thrown; so that a being $= 1$, and $b = 5$, $a^4 + 4\,a^3\,b + 6\,a^2\,b^2$, will be $= 1 + 20 + 150 = 171$, and the whole number of chances, viz. $(a+b)^4 = 1296$; consequently the probability required will be expressed by $\frac{171}{1296}$. See Case 6. The probability of the contrary will be $\frac{1125}{1296}$; for in the two terms of the fourth power of $a+b$, $4\,a\,b^3 + b^4$, a is found only once in the first, and not at all in the second; therefore, these will express the number of chances against throwing two aces, which is $= 500 + 625 = 1125$. And the probability of succeeding will be $1 - \frac{1125}{1296} = \frac{171}{1296}$, as before. And universally, the last term of any power $(a+b)^n$ being b^n, and the last but one $n\,a\,b^{n-1}$, in neither of which a^2 enters, it follows that the two last terms of that power express the number of chances that are contrary to the throw-

ing of two aces, in any number of throws denominated by n; and that the probability of throwing two aces will be $1 - \frac{nab^{n-1} + b^n}{(a+b)^n} = \frac{(a+b)^n - nab^{n-1} - b^n}{(a+b)^n}$. And likewise, in the three last terms of the power $(a+b)^n$, every one of the indices of a will be less than three, and consequently those last terms will shew the number of chances that are contrary to the throwing of an ace three times in any number of trials n; and the same rule will hold perpetually. If the chances for happening and failing in any particular trial be respectively represented by a and b, the preceding rules may be applied to the happening or failing of any other kind of event in any number of times.

12. If A lays a wager that a certain event will happen l times in n trials, and B lays to the contrary, and the number of chances of happening and failing in one trial be respectively a and b, the number of chances whereby B may win his wager will be determined by as many of the last terms of the power $(a+b)^n$ expanded, as are represented by l. And the number of chances whereby A may be a winner, will be expressed by as many of the first terms of the same power as are equal to p; p being assumed equal to $n-l+1$; because B, by laying against A's winning l times, does in effect lay that he will not win above $l-1$ times; but the whole number of winnings and losings being n, $(n-l)-1$, or $n-l+1$, will be the number of times which B himself undertakes to win.

13. If A and B being at play, respectively want l and p games of being up, and their respective chances for winning any one game be as a to b; raise the binomial $a+b$ to a power whose index is $l+p-1$, and the number of chances, whereby they may respectively win the set, will be in the same proportion as the sum of so many of the first terms as are expressed by p, to the sum of so many of the last terms as are expressed by l; for when A and B respectively undertook to win l games and p games, and n represented the whole number of games, in the preceding case, p was $= n-l+1$, and, therefore, $l+p=n+1$, and $n=l+p-1$, which will, consequently, represent the power to which $a+b$ must be raised. E. gr. Let $l=3$, $p=7$, $a=3$, and $b=5$; then raise $a+b$ to the power represented by $l+p-1$, i. e. to the ninth power, and the sum of the first seven terms will be to the sum of the three last, in the proportion of the respective chances whereby A and B may win the set. The chances of B, or the three last terms, are $b^9 + 9ab^8 + 36aab^7 = 37812500$, which, divided by $(a+b)^9 = 134217728$, gives the fraction $\frac{37812500}{134217728} = \frac{9453125}{33554432}$, expressing the probability of B's winning; and this fraction, subtracted from unity, or $1 - \frac{9453215}{33554432} = \frac{24101307}{33554432}$, will express the probability of A's winning; and the odds in favour of A are in the proportion of 24101307 to 9453125, or nearly as 23 to 9. See Case 10. Examples often occur, as in this case, in which it is required to sum up several terms of a high power of the binomial $a+b$, and to divide their sum by that power; the most convenient method of doing this is to write 1 and q for a and b, having taken $q : 1 :: b : a$, and to use a table of logarithms. Thus, in the preceding example, $a = 3$, $b=5$, therefore $q = \frac{5}{3}$; and the quantity $\frac{b^9 + 9ab^8 + 36a^2b^7}{(a+b)^9}$ becomes $= \frac{q^9 + 9q^8 + 36q^7}{(1+q)^9} = \frac{q^7 \times (q^2 + 9q + 36)}{(1+q)^9}$: but the factor $q^2 + 9q + 36$ is $= \frac{25}{9} + \frac{45}{3} + 36 = \frac{484}{9}$, and its logarithm is the

logarithm of 484 — log. 9. =	1.7306029
To which add the log. of q^7, or 7 × log. 5 — log. 3. =	1.5529409
And from the sum — -	3.2835438
Subtract the log. of $(1+q)^9$ or 9 × (log. 8.—log. 3.) =	3.8337183
And the remainder — —	1.4498255

will be the logarithm of B's chance, viz. 0.281725, and the complement of this to unity, or 0.718275, will be the chance of A. See another method of reducing ratios in larger numbers to their least exact terms, under RATIO.

The following TABLE shews the odds of winning, when the number of games wanting does not exceed six, and the skill of the contenders is equal.

Games wanting.		Odds of winning.	Games wanting		Odds of winning.	Games wanting.		Odds of winning
1,2	-	3,1	2,3	-	11,5	3,5	-	99,29
1,3	-	7,1	2,4	-	26,6	3,6	-	219,37
1,4	-	15,1	2,5	-	57,7	4,5	-	163,93
1,5	-	31,1	2,6	-	120,8	4,6	-	382,130
1,6	-	63.1	3,4	-	42,22	5,6	-	638,386

14. *To assign the probability of throwing one ace, and no more, with four dice at one throw.* From the number of chances whereby one ace or more may be thrown, subtract the number of chances whereby two aces or more may be thrown, and the remainder will be the number of chances for throwing one ace, and no more. Having raised the binomial $a+b$ to its fourth power, which is $a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$, it is evident, that the four first terms express the number of chances for throwing one ace or more; and the three first terms express the number of chances for throwing two aces or more; and, therefore, the single term $4ab^3$ expresses the number of chances for throwing one ace and no more; and the probability required will be $\frac{4ab^3}{(a+b)^4} = \frac{500}{1296} = \frac{125}{324}$. See Case 7.

When it is required to assign the chances for throwing any number of aces, and no more than that number, one single term of the power $(a+b)^n$ will always answer the question; and this term may be expeditiously found, supposing n to be the number of dice, and l the precise number of aces to be thrown, when l is less than $\frac{1}{2}n$, by writing as many terms of the series $\frac{n}{1}, \frac{n-1}{2}, \frac{n-3}{3}, \frac{n-3}{4}$, &c, as there are units in l; and when l is greater than $\frac{1}{2}n$, by writing as many of them as there are units in $\frac{1}{2}n-l$; then multiplying all those terms together, and multiplying the product by $a^l b^{n-l}$; and this last product will exhibit the term expressing the number of chances required. E. gr. Let l be $=3$, and $n=10$; since l is less than $\frac{1}{2}n$, take three terms of the series, which will be

$\frac{10}{1}, \frac{9}{2}, \frac{8}{3}$; their product will be 120: $a^{l}\ b^{n-l}$, a being $= 1$, $b = 9$, &c. will be $= 6042969$; and $6042969 \times 120 = 725156280$, which expresses the number of chances required. Divide this by $(a+b)^{10} = 10000000000$, and the quotient 0.0725156280, will express the probability of throwing precisely three aces with ten dice: subtract this quotient from unity, and the remainder 0.9274843720 will express the probability of the contrary; and the odds against throwing precisely three aces with ten dice, are 9274843720 to 725156280, or nearly 64 to 5.

Having thus given as compendious a view as possible of the principles and rules of *gaming*, from Mr. De Moivre's Introduction, we shall select a few problems, for the farther illustration and exercise of these principles and rules.

Prob. I. *If* A *and* B *play with single bowls, and* A *can give* B *two games out of three; what is the proportion of their skill*, or *what are the odds, that* A *may get any one game assigned?* Let the proportion of odds be as z to 1; now since A can give B two games out of three, A may, upon an equality of play, undertake to win three games together; but the probability of his winning the first time is $\frac{z}{z+1}$ and the probability of his winning three times together is $\frac{z}{z+1} \times \frac{z}{z+1} \times \frac{z}{z+1} = \frac{z^3}{(z+1)^3}$. But, as A and B are supposed to play on equal terms, the probability which A has of winning three games together ought to be expressed by $\frac{1}{2}$; and, therefore, $\frac{z^3}{(z+1)^3} = \frac{1}{2}$, or $2z^3 = (z+1)^3$; and, extracting the cube root on both sides, $z\sqrt[3]{2} = z+1$; and $z\sqrt[3]{2} - z = 1$; therefore $z = \frac{1}{\sqrt[3]{2}-1}$; and the odds in favour of A's getting any game assigned, are as $\frac{1}{\sqrt[3]{2}-1}$ to 1, or as 1 to $\sqrt[3]{2}-1$, i. e. as 50 to 13 very nearly.

Prob. II. *To find in how many trials any event will probably happen, so that* A *and* B *may lay a wager on even terms.* Let the number of chances for its happening in any one trial be a, and the number of chances for its failing be b; and the number of trials x. By Case 12. b^x will represent the number of chances of the event's failing x times successively, and $(a+b)^x$ the whole number of chances for happening or failing; and, therefore, $\frac{b^x}{(a+b)^x}$ represents the probability of the event's failing x times together, which is equal to the probability of its happening once at least in that number of trials; and either of these may be expressed by the fraction $\frac{1}{2}$; consequently $\frac{b^x}{(a+b)^x} = \frac{1}{2}$, or $(a+b)^x = 2b^x$; therefore x, $\times$ logarithm $(a+b) = x \times$ logar. q + logar. 2. and $x = \frac{\text{log. } 2.}{\text{log.}(a+b) - \text{log. } b}$. Again, suppose $a : b :: 1 : q$, then the equation $(a+b)^x = 2b^x$, will be changed into $(1+q)^x = 2q^x$, or $\left(\frac{1+q}{q}\right)^x = 2$, or $\left(1+\frac{1}{q}\right)^x = 2$. Therefore, $x \times \text{log.}\left(1+\frac{1}{q}\right) = \text{log. } 2$. If, in this equation, $q = 1$, x will also be $= 1$; but if q differs from unity, substitute in the room of log. $\left(1+\frac{1}{q}\right)$ its value expressed in a series, viz.

$$\frac{1}{q} - \frac{1}{2q^2} + \frac{1}{3q^3} - \frac{1}{4q^4} + \frac{1}{5q^5} - \frac{1}{6q^6}, \text{ \&c.}$$

and we shall have the equation $\frac{x}{q} - \frac{x}{2q^2}$, &c. $=$ log. 2. If q be infinite, or large in respect to unity, the first term of the series will be sufficient; and we shall have the equation $\frac{x}{q} =$ log. 2, or $x = q \times$ log. 2. Then taking the hyperbolic logarithm of 2, which is 0.693, &c. or 0.7 nearly, x will be equal to $0.7q$ nearly. Thus the limits of the ratio of x to q are assigned; for it begins with unity, and terminates at last in the ratio of 7 to 10 very nearly. This value of x may be assumed in all cases, whatever be the value of q.

Ex. 1. *To find in how many throws one may undertake with an equality of chance to throw two aces with two dice.* The number of chances upon two dice being 36, of which there is but one chance for two aces, the number of chances against it is 35; multiply, therefore, 35 by 0.7, and the product 24.5 will shew that the number of required throws will be between 24 and 25.

Ex. 2. *To find in how many throws of three dice one may undertake to throw three aces.* The number of all the chances on three dice being 216, of which there is but one chance for three aces, and 215 against it, multiply 215 by 0.7, and the product 150.5, will shew that the number of required throws will be 150 nearly.

Prob. III. *To find how many chances there are upon any number of dice, each of them having the same number of faces, to throw any given number of points.* Let $p+1$ be the given number of points, n the number of dice, and f the number of faces in each dice: let $p-f=q$, $q-f=r$, $r-f=s$, $s-f=t$, &c. The number of chances required will be,

$$+\frac{p}{1} \times \frac{p-1}{2} \times \frac{p-2}{3}, \text{ \&c.}$$

$$-\frac{q}{1} \times \frac{q-1}{2} \times \frac{q-2}{3}, \text{ \&c.} \times \frac{n}{1}$$

$$+\frac{r}{1} \times \frac{r-1}{2} \times \frac{r-2}{3}, \text{ \&c.} \times \frac{n}{1} \times \frac{n-1}{2}$$

$$-\frac{s}{1} \times \frac{s-1}{2} \times \frac{s-2}{3} \text{ \&c.} \times \frac{n}{1} \times \frac{n-1}{2} \times \frac{n-2}{3} +, \text{ \&c.}$$

And these serieses ought to be continued till some of the factors in each product become either $=0$, or negative: and so many factors are to be taken in each of the products $\frac{p}{1} \times \frac{p-1}{2}$, &c. $\frac{q}{1} \times \frac{q-1}{2}$, &c. as there are units in $n-1$. See the demonstration of this rule in De Moivre's Doctrine of Chances, p. 41.

Ex. 1. *To find how many chances there are for throwing sixteen points with four dice.* Here $p+1=16$ and $p=15$; and the foregoing series will be,

$$+\frac{15}{1} \times \frac{14}{2} \times \frac{13}{3} = +\ 455$$

$-\frac{9}{1}\times\frac{8}{2}\times\frac{7}{3}\times\frac{4}{1}=-336$

$+\frac{3}{1}\times\frac{2}{2}\times\frac{1}{3}\times\frac{4}{1}\times\frac{3}{2}=+6$. And 455 − 336 + 6 = 125 is the number of chances required.

Ex. 2. *To find the number of chances for throwing fifteen points with six dice.* The series will be,

$$+\frac{14}{1}\times\frac{13}{2}\times\frac{12}{3}\times\frac{11}{4}\times\frac{10}{5}=+2002$$

$$-\frac{8}{1}\times\frac{7}{2}\times\frac{6}{3}\times\frac{5}{4}\times\frac{4}{5}\times\frac{6}{1}=-336.$$

And 2002−336=1666 the number required. In like manner it may be found that the number of chances for throwing twenty-seven points with six dice is also 1666. We may observe in general, that all the points equally distant from the extremes, i. e. from the least and greatest points that are upon the dice, have the same number of chances by which they may be produced: thus, in finding the number of chances for throwing twenty-seven points with six dice, let 27 be subtracted from 42, the sum of the extremes 6 and 36, and the remainder being 15, we may infer that the number of chances for throwing twenty-seven points is the same as for throwing fifteen points.

Ex. 3. *To find in how many throws of six dice one may undertake to throw fifteen points precisely.* The number of chances for throwing fifteen points being 1666, and the whole number of chances upon six dice being 46656, it follows that the number of chances for failing is 44990; therefore, dividing 44990 by 1666, and the quotient is 27 nearly; multiply 27 by 0.7, and the product 18.9 will shew that the number of throws required will be very near 19.

Prob. IV. *To find how many trials are necessary to make it equally probable that an event will happen twice.* Let a, b, and x, be as in Prob. II. Then by Case 12. $b^x + x a b^{x-1}$ is the number of chances whereby the event may fail, and $(a+b)^x$ the whole number of chances whereby it may happen or fail, and, therefore, the probability of its failing is $\frac{b^x + x a b^{x-1}}{(a+b)^x}$; but as the probabilities of happening and failing are equal, we shall have the equation $\frac{b^x + x a b^{x-1}}{(a+b)^x}=\frac{1}{2}$, or $(a+b)^x = 2b^x + 2xab^{x-1}$; or making $a:b::1:q$, $\left(1+\frac{1}{q}\right)^x = 2 + \frac{2x}{q}$. Let $q=1$, and x will be $=3$, But if q be infinite, and $\frac{x}{q}=z$; and $z=$ log. 2 + log. $(1+z)$, and the value of z will be found $=1.678$ nearly; therefore the value of x will always be between the limits $3q$ and $1.678q$, but will soon converge to the last of these limits; and if q be not very small, x may in all cases be supposed $= 1.678q$: but if x be suspected to be too little, substitute this value in the original equation $\left(1+\frac{1}{q}\right)^x=2+\frac{2x}{q}$, and note the error; if it be worth regarding, increase a little the value of x, and substitute this new value in the aforesaid equation, and noting the new error, the value of x may be sufficiently corrected by the rule of double false position.

Ex. 1. *To find in how many throws of three dice one may undertake to throw three aces twice.* The number of all the chances on three dice being 216, of which there are 215 against throwing three aces; multiply, therefore, 215 by 1.678, and the product 360.8 will give the number of required throws.

Ex. 2. *To find in how many throws of six dice one may undertake to throw fifteen points twice.* The number of chances for throwing fifteen points is 1666, and the number of chances for missing 44990, see Prob. III. Divide 44990 by 1666, and the quotient will be 27 nearly; therefore, the chances for throwing and missing fifteen points are as 1 to 27 respectively: multiply 27 by 1.678, and the product 45.3 will be the number of required throws.

Prob. 5. *To find how many trials are necessary to make it equally probable that an event will happen 3, 4, 5, &c. times.* Let a, b, and x, be as before; and $a:b::1:q$; then $\left(1+\frac{1}{q}\right)^x=2\times\left(1+\frac{x}{q}+\frac{x}{1}+\frac{x-1}{2q^2}\right)$ in the case of the triple event; and $\left(1+\frac{1}{q}\right)^x=2\times\left(1+\frac{x}{q}+\frac{x}{1}\times\frac{x-1}{2q^2}+\frac{x}{1}\times\frac{x-1}{2}\times\frac{x-2}{3q^3}\right)$ in case of the quadruple event, &c. Then if q in the first equation be supposed $=1$, x will be $=5$; if q be infinite, or very large in respect to unity, the aforesaid equation, making $\frac{x}{q}=z$, will become $z=$ log. 2 + log. $(1+z+\frac{1}{2}zz)$; and z will be found nearly $=2.675$, and x will always be between $5q$ and $2.675q$. In the second equation, if q be $=1$, x will be $=7q$, but if q be infinite, or very large in respect to unity, z will be = log. 2 + log. $\left(1+z+\frac{1}{2}zz+\frac{1}{9}z^3\right)$; and z will be found nearly $=3.6719$, and x will be between $7q$ and $3.6719q$.

A Table of the Limits.

The value of x will always be

For a single event, between	$1q$	and	$0.693q$
For a double event, between	$3q$	—	$1.678q$
For a triple event, between	$5q$	—	$2.675q$
For a quadruple event, between	$7q$	—	$3.672q$
For a quintuple event, between	$9q$	—	$4.670q$
For a sextuple event, between	$11q$	—	$5.668q$
&c.			

And if the number of events contended for, as well as the number q, be pretty large in respect to unity; the number of trials required for those events to happen n times will be $\frac{2n-1}{2}q$, or barely nq.

Prob. VI. *Two gamesters A and B, each having twelve counters, play with three dice, on condition that if eleven points come up, B shall give one counter to A; if fourteen points come up, A shall give one counter to B; and that he shall be the winner who shall soonest get all the counters of his adversary; what is the probability that each of them has of winning?* Let p be the number of counters of each, and a and b the number of chances they have respectively for getting a counter at each cast of the dice; their probabilities of winning are respectively as a^p to b^p: and p being = 12, and a = 27, and b = 15, by Prob. III. the probabilities of winning are respectively

27^{12} to 15^{12}, or as 9^{12} to 5^{12}, or as 282429536481 to 244140625. See the demonstration of this rule in Doctrine of Chances, p. 52.

Prob. VII. *Two gamesters* A *and* B *lay by twenty-four counters, and play with three dice on this condition, that if eleven points come up,* A *shall take one counter out of the heap; if fourteen,* B *shall take one; and he shall be reputed the winner who shall soonest get twelve counters.*

This problem differs from the preceding, in that the game must necessarily end in twenty-three throws, whereas in the former, the play may be unlimited, on account of the reciprocations of loss and gain, which destroy one another. Let a and b represent the proportion of the chance for throwing 11 and 14; and raise $a+b$ to the twenty-third power, or to a power whose index is the number of all the counters wanting one, and the 12 first terms of that power will be to the 12 last in the same proportion as the probabilities of winning.

Prob. VIII. *Three gamesters* A, B, *and* C, *out of a heap of twelve counters, of which four are white and eight black, draw blindfold one counter at a time, in this manner:* A *begins to draw,* B *follows* A, C *follows* B; *then* A *begins again: and they continue to draw in the same order, till one of them, who is to be reputed the winner, draws the first white: what are their respective probabilities of winning?* Let n be the number of counters, a the number of white, and b the number of black, and 1 the stake or sum played for.

1. A has a chances for a white counter, and b chances for a black one; and, therefore, the probability of his winning is $\frac{a}{a+b}=\frac{a}{n}$; and his expectation on the stake 1, when he begins to draw, is $\frac{a}{n}\times 1=\frac{a}{n}$: now $\frac{a}{n}$ being taken out of the stake, there will remain, $1-\frac{a}{n}=\frac{n-a}{n}=\frac{b}{n}$.

2. B has a chances for a white counter, and the number of remaining counters is $n-1$; therefore his probability of winning will be $\frac{a}{n-1}$, and his expectation on the remaining stake $\frac{b}{n}$ will be $\frac{ab}{n\times(n-1)}$: subtract $\frac{ab}{n\times(n-1)}$ from $\frac{b}{n}$, and the remaining stake will be $\frac{b}{n}-\frac{ab}{n\times(n-1)}=\frac{nb-b-ab}{n\times(n-1)}$; but $nb-ab=bb$; therefore it will be $\frac{b\times(b-1)}{n\times(n-1)}$.

3. C has a chances for a white counter, and the number of remaining counters is $n-2$; therefore his probability of winning will be $\frac{a}{n-2}$; and his expectation in the remaining stake will be $\frac{b\times(b-1)\times a}{n\times(n-1)\times(n-2)}$.

4. A may have out of the remainder the sum $\frac{b\times(b-1)\times(b-2)\times a}{n\times(n-1)\times(n-2)\times(n-3)}$, &c. till the whole stake be exhausted.

Wherefore, write down the series $\frac{a}{n}+\frac{b}{n-1}P+\frac{b-1}{n-2}Q+\frac{b-2}{n-3}R+\frac{b-3}{n-4}S$, &c. in which P, Q, R, S, &c. denote the preceding terms, and take as many terms of this series as there are units in $b+1$, (for b representing the number of black counters, the number of drawings cannot exceed $b+1$), then the sums of the first, fourth, seventh, &c. terms, of the second, fifth, eighth, &c. terms, and of the third, sixth, &c. terms will be the respective expectations of A, B, C; or, as the stake is fixed, these sums will be proportional to their respective probabilities of winning. Let n, then, in the case of this problem, $=12$, $a=4$, and $b=8$; and the general series will become $\frac{4}{12}+\frac{8}{11}$

$$\frac{7}{10}Q+\frac{6}{9}R+\frac{5}{8}S+\frac{4}{7}T+\frac{3}{6}U+\frac{2}{5}X+\frac{1}{4}Y;$$

or, multiplying the whole by 495 in order to take away the fractions, the series will be $165+120+84+56+35+20+10+4+1$; and A will have $165+56+10=231$, B, $120+35+4=159$, and C, $84+20+1=105$; therefore their respective probabilities of winning will be proportional to the numbers 231, 159, and 105, or 77, 53, and 35.

Prob. IX. A *and* B *having twelve counters, four of them white, and eight black;* A *wagers with* B, *that taking out seven counters, blindfold, three of them shall be white: what is the ratio of their expectancies?* 1. Seek how many cases there are for seven counters to be taken out of twelve; they will be found from the doctrine of combinations to be 792.

$$\frac{12}{1}\times\frac{11}{2}\times\frac{10}{3}\times\frac{9}{4}\times\frac{8}{5}\times\frac{7}{6}\times\frac{6}{7}=792.$$

2. Set aside three white ones, and find all the cases wherein four of the eight black ones may be combined therewith; they will be found to be 70.

$$\frac{8}{1}\times\frac{7}{2}\times\frac{6}{3}\times\frac{5}{4}=70.$$

And since there are four cases, in which three white may be taken out of four; multiply 70 by 4: thus the cases, wherein three whites may come out with four blacks, are found to be 280.

3. By the common rules of *gaming*, he is reputed conqueror, who produces an effect oftener than he undertook to do, unless the contrary be expressly agreed on; and therefore, if A take out four whites with three blacks, he wins. Set aside four whites, and then find all the cases wherein three of the eight blacks may be combined with four whites: these cases will appear to be 56.

$$\frac{8}{1}\times\frac{7}{2}\times\frac{6}{3}=56.$$

4. A therefore has $280+56=336$ chances, whereby he may win; which, subtracted from the whole number of chances 792, leaves 456, the number of chances wherein he may lose. Divide 336 by 792, and the quotient $\frac{336}{792}=\frac{14}{33}$ will express the probability of A's winning; and $1-\frac{14}{33}=\frac{19}{33}$ the probability of his losing; and therefore the odds against taking three white counters are 19 to 14.

From the solution of this problem it appears, that, if a BE = the number of white counters, b the number of black, n the whole number $=a+b$, c the number of counters to be taken out of n, and p the number of white counters to be found precisely in c, then the number of chances for taking none of the white, or one single white, or two white and no more, or three white and no

more, or four white and no more, &c. will be expressed by $1\times\frac{a}{1}\times\frac{a-1}{2}\times\frac{a-2}{3}\times\frac{a-3}{4}$, &c. $\times\frac{b}{1}\times\frac{b-1}{2}\times\frac{b-2}{3}$, &c. continued till the number of terms in which there is a be equal to p, and the number of terms in which there is b be equal to $c-p$. And the number of all the chances for taking a certain number c of counters out of the number n is expressed by the series $\frac{n}{1}\times\frac{n-1}{2}\times\frac{n-2}{3}$. &c. continued to as many terms as there are units in c, for a denominator. E. gr. Resume the supposition of the problem, only that of the seven counters drawn, there shall not be one white; and let $p=0$, and $c-p=7=bl$; then taking 1 of the first series and 7 terms of the second, the number of chances will be 1×8; the ratio of which to all the 7's that can be taken out of 12 is $\frac{8}{792}=\frac{1}{99}$: therefore the odds that there shall be one or more white counters among the 7 which are drawn are 98 to 1. The probability of drawing one white counter and no more will be $\frac{112}{792}=\frac{14}{99}$, or the odds 85 to 14: the probability of drawing all the 4 white among the 7 will be $\frac{56}{792}=\frac{7}{99}$; or the odds 92 to 7. If n and c were large, the foregoing method would be impracticable; and, therefore, the following theorem may be used. Let n, c, and p be as before; and make $n-c=d$. The probability of taking precisely the number p of white counters will be

$$\frac{c\times c-1\times c-2,\ \&c.\ \times d\times d-1\times d-2,\ \&c.\ \times\frac{a}{1}\times\frac{a-1}{2}\times\frac{a-2}{3},\ \&c.}{n\times n-1\times n-2\times n-3\times n-4\times n-5\times n-6\times n-7\times n-8,\ \&c.}$$

Note, The first series of the numerator contains as many terms as there are units in p; the second as many as there are units in $a-p$; and the third as many as there are units in p; and the denominator as many as there are units in a.

To avoid tiresome prolixity in this article, we must desist from farther investigations; which, in the following problems, grow very long, and more perplexed. In the rest, therefore, we shall content ourselves to give the answer, or result, without the process of arriving at it; which may be of use, as it furnishes so many data, from whence, as standards, we may be enabled occasionally to judge of the probability of events of the like kinds; though without letting the mind into the precise manner and reason thereof.

Prob. X. *A and B play with two dice on this condition, that A shall win, if he throws six: and B, if he throws seven: A to have the first throw, in lieu of which B to have two throws; and both to continue with two throws each turn, till one of them wins: What is the ratio of the chance of A to that of B? Ans. As* 10355 *to* 12276.

Prob. XI. *If any number of gamesters, A, B, C, D, E, &c. equal in point of dexterity, deposit each one piece of money; and engage, on these conditions, that two of them, A and B, beginning the game, whichever of them shall be overcome, shall give place to the third C, who is to play with the conqueror; and the conqueror here to be taken up by the fourth man D; and thus on, till some one, having conquered them all round, draws the stake: what is the ratio of their expectancies?* This problem M. Bernoulli solves analytically. Here, calling the number of gamesters $n+1$, he finds that the probabilities of any two immediately following each other in the course of playing, are in the ratio $1+2^n$ to 2^n; and therefore the expectancies of the several gamesters, A, B, C, D, E, &c. are in a geometrical progression $1+2^n : 2^n :: a : c :: c : d :: d : e$, &c. Hence it is easy to determine the state of the probabilities of any two gamesters, either before the game, or in the course thereof. If, *e. gr.* there be three gamesters, A, B, C, then $n=2$ and $1+2^n : 2^n :: 5 : 4 :: a : c$; that is, their several probabilities of winning, before A have overcome B, or B, C, are as the numbers 5, 5, 4; and therefore their expectancies are $\frac{5}{14}$, $\frac{5}{14}$, $\frac{4}{14}$: for all of them taken together must make 1, or absolute certainty. After A has overcome B, the probabilities for A, B, and C, will be $\frac{1}{7}$, $\frac{2}{7}$, $\frac{4}{7}$, as in the answer above. If there be four gamesters, A, B, C, D, their probabilities from the beginning will be as 81, 81, 72, 64. After A has beat B, the several probabilities of B, D, C, A, will be as 25, 32, 36, 56, respectively. After A has beat B and C, the probabilities of C, B, D, A, will be as 16, 18, 28, 87.

Prob. XII. *Three gamesters, A, B, and C, whose dexterities are equal, deposit each one piece, and engage upon these terms: that two of them shall begin to play, and that the vanquished party shall give place to the third, who is to take up the conqueror; and the same condition to go round: each person when vanquished, forfeiting a certain sum to the main stake; which shall be all swept by the person who first beats the other two successively. How much, now, is the chance of A, and B, better or worse than that of C?* 1. If the forfeiture be to the sum each person first deposited, as 7 to 6, the gamesters are upon an equal footing. 2. If the forfeiture be in a less ratio to the deposit, A and B are on a better footing than C; if in a greater ratio, the advantage is on the side of C. 3. If there were no fines, the probabilities of winning would be proportional to the expectations; and the expectations, after the first game, would be $\frac{12}{7}$, $\frac{6}{7}$, $\frac{2}{7}$, the first belonging to B, the second to C, and the third to A; and, therefore, dividing the sum of the probabilities belonging to A and B into two equal parts, the probabilities of winning would be proportional to the numbers 5, 4, 5; and it is 5 to 2 before the play begins that either A or B win the set, or 5 to 4 that one of them who shall be fixed upon win it. 4. If three gamesters, A, B, and C are engaged in a *poule*, and have not time to play it out, but agree to divide (s) the sum of the stake and fines, in proportion to their respective chances; $\frac{4}{7}s$ will be the share of B, who has got one game: $\frac{2}{7}s$ that of C, who should next come in, and $\frac{1}{7}s$ the share of A, who was last beat.

M. Bernoulli gives an analytical solution of the same problem, only made more general; as not being confined to three gamesters, but extending to any number at pleasure.

Prob. XIII. *A and B, two gamesters of equal dexterity, play with a given number of balls; after some*

time, A wants 1 of being up, and B 3: what is the ratio of their chances? A's expectancy is worth $\frac{7}{8}$ of the stake, and B's only $\frac{1}{8}$; so that their chances are as 7 to 1.

Prob. XIV. *Two gamesters, A and B, of equal dexterity, are engaged in play, on this condition, that as often as A exceeds B, he shall give him one piece of money; and that B shall do the like, as oft as A exceeds him; and that they shall not leave off till one has won all the other's money: and now having four pieces, two by-standers, R and S, lay a wager on the number of turns in which the game shall be finished;* viz. R, *that it shall be over in ten turns: what is the value of the expectancy of* S? $\frac{560}{1024}$, or $\frac{35}{64}$ of the wager; or it is to that of R as 560 to 464: and subtracting $\frac{35}{64}$ from 1, the remainder $\frac{29}{64}$ will express the probability of the play ending in ten games; and it is 35 to 29, if two equal gamesters play together, that there will not be four stakes lost on either side in ten games.

If each player has five pieces, and the wager were, that the game shall end in ten turns, and the dexterity of A were double that of B, the expectancy of S would be $\frac{3800}{6561}$.

If each gamester have four pieces, and the ratio of the dexterities be required to make it an even wager, that the game shall end in four turns, it will be found that the one must be to the other as 5.274 to 1. And if the skill of either be to that of the other as 13.407 to 1, it is a wager of 3 to 1, that the play will be ended in four games.

If each gamester have four pieces, and the ratio of their dexterities be required to make it an even lay, that the game shall be ended in six turns, the answer will be found to be as 2.576 to 1.

Prob. XV. *Two gamesters, A and B, of equal dexterity, having agreed not to leave off playing till ten games are over: a spectator, R, lays a wager with another, S, that by that time, or before, A shall have beat B by three games: what is the value of the expectancy of* R? $\frac{350}{1024}$, or $\frac{11}{32}$ of the same wager; or it is to that of S, as 352 to 672. See Basset, Hazard, Lottery, Piquet, Quadrille, Raffling, Whisk, &c.

GAMMARUS, in the Fabrician system of entomology, a tribe of the cancer genus. See Cancer.

GA'MMER. *s.* The compellation of a woman corresponding to *gaffer*.

GA'MMON. *s.* (*gambone*, Italian.) 1. The buttock of a hog salted and dried; the lower end of the flitch (*Dryden*). 2. A kind of play with dice (*Thomson*).

GAMMUT, Gamut, or Gam-ut, in music, the name given to the table or scale laid down by Guido Aretinus, to the notes of which he applied the syllables, *ut, re, mi, fa, sol, la*. See Guido.

The gammut is also called the harmonical hand, because Guido first arranged his notes upon the figure of a hand.

This scale is an improvement upon the diagram of the ancients, which was indeed confined within too narrow limits. Guido added four notes above the note hyperbolæon, and one below the proslambanomenos: the latter he called hypo-proslambanomenos, and denoted it by the letter G or the Greek Γ gamma, which, being at the foot of the scale, imparted a name to the whole. The gammut was divided into three columns, the first called *molle* (flat), the second *natural*, and the third *durum* (sharp). It consisted of twenty notes, viz. two octaves and a major sixth. The first octave was distinguished by capital letters, as G, A, B, &c. The second by small letters, g, a, b, &c. and the supernumerary sixth by double letters, as gg, aa, bb, &c. By the word gammut we now generally understand the whole present existing scale; and to learn the names and situations of its different notes is to learn the gammut.

'GAN, for *began*, from *'gin*, for *begin* (*Spenser*).

GANACHES, in the manage, the two bones on each side of the hinder part of a horse's head, opposite its onset, or neck, which form the lower jaw, and give it motion. Here it is that those glands are placed which are chiefly affected in the strangles or glanders.

To GANCH. *v. a.* (*ganciare*, Italian.) To drop from a high place upon hooks, by way of punishment; a practice in Turkey.

GA'NDER. *s.* (ʒanᵭɲa, Saxon.) The male of the goose. See Anas.

GANDERSHEIM, a town of Lower Saxony, in Germany. Lat. 51. 54 N. Lon. 18. 20 E.

To GANG. *v. a.* (*gangen*, Dutch.) To go; to walk: an old word not now used, except ludicrously (*Spenser. Arbuthnot*).

Gang. *s.* (from the verb.) A number herding together; a troop; a company; a tribe (*Prior*).

GANGES, a river of Asia, which rises by two branches from the mountains of Kentaisse, in the country of Thibet; these two branches take a westerly direction, inclining to the north, for a course of about 300 miles in direct distance, when meeting the great chain or ridge of mount Himmaleh, which extends from Cabul along the north of Hindustan, and through Thibet, the rivers are compelled to turn to the south, in which course they unite their waters, and form what is properly termed the river Ganges. This body of water now forces a passage through the ridge of mount Himmaleh, at the distance, possibly, of 100 miles below the place of its first approach to it, and sapping its foundation, rushes through a cavern, and precipitates itself into a vast bason, which it has worn in the rock, at the hither foot of the mountains. From this second source (as it may be termed) of the Ganges, its course becomes more eastwardly than before, through the rugged country of Sirinagur, until, at Hurdwar, it finally escapes from the mountainous tract, in which it has wandered for about 800 British miles. At Hurdwar it opens itself a passage through mount Sewallick; which is the chain of mountains that borders on the level country, on the north of the province of Delhi. After entering Hindustan, it passes

by Anopsheer, Furruckabad, Canoga, Cawnpour, Allahabad, where it is joined by the Jumna, Merzapour, Chunar, Benares, Patna, thirty-six miles above which it is joined by the Dewah, and sixteen miles above the same town by the Soane, and opposite to it by the Gunduck. After leaving Patna, it passes by Bar, Monghir, forty miles east of which it is joined by the Cosa, it then passes by Rajemal, forty miles below which it is joined by a branch of the Sanpoo, or Teesta, and eighty miles below that by another branch of the same river. Soon after which it divides into a multitude of branches, called the Mouths of the Ganges, which empty themselves into the Bay of Bengal, in Lat. 21. 40. to 22 N. See BURRAMPOOTER.

The Hindus regard this river as a kind of deity; hold its waters in high veneration, and visit it annually from all parts of Hindustan, in order to perform certain superstitious rites.

GANGLION. (*ganglion*, γαγγλιον, a knot.) In anatomy, is applied to a knot in the course of a nerve. In surgery it is an encysted tumour, formed in the sheath of a tendon, and containing a fluid like the white of an egg. It most frequently occurs on the back of the hand or foot.

GANGRENE. (*gangræna*, γαγγραινω; from γραινω, to feed upon.) A mortification of any part of the body, before endowed with vitality. It is known by the insensibility, coldness, lividness, and flaccidity of the part, and by the fœtor it exhales.

To GA'NGRENE. *v.a.* (*gangrener*, French.) To corrupt to mortification (*Dryden*).

To GA'NGRENE. *v. n.* To become mortified (*Wiseman*).

GA'NGRENOUS. *a.* (from *gangrene.*) Mortified; producing or betokening mortification (*Arbuthnot*).

GANGUE, or MATRIX, is a general term to express the earthy and stony substances in which metallic ores are generally enveloped. These substances are various; frequently spar, quartz, fluors, hornblend, or sulphat of barytes. By German mineralogists, the word *gang* is used in a different sense, to denote the metallic vein itself.

GA'NGWAY. *s.* In a ship, the several ways or passages from one part of it to the other.

GA'NGWEEK. *s.* (*gang* and *week.*) Rogation week.

GANJAM, a town of the peninsula of Hindustan, in one of the northern Circars, subject to the English. Lat. 19. 22 N. Lon. 85. 20 E.

GANNET, in ornithology. See PELICANUS.

GA'NTELOPE. GA'NTLET. *s.* (*gantelope*, Dutch.) A military punishment, in which the criminal running between the ranks receives a lash from each man (*Dryden*).

GANAMEDE, in fabulous history, son of Tros, king of Troy, was the most beautiful youth that ever was seen. Jupiter was so charmed with him, that he carried him away, and made him his cup-bearer in the room of Hebe. He deified this youth, and to comfort his father, made him a present of some very swift horses. The abbe le Pluche observes, that Ganymede was the name of the horse or image exposed by the ancient Egyptians, to warn the people before their annual inundations, to raise their terraces to a just and proper height.

GANZA, a kind of wild goose (*Hudibras*).

GAOL (*gaola*, Fr. *geole*, i. e. *caveala*, a cage for birds), is used metaphorically for a prison. It is a strong place or house for keeping of debtors, &c. and wherein a man is restrained of his liberty to answer an offence done against the laws: and every county hath two gaols; one for debtors, which may be any house where the sheriff pleases; the other for the peace and matters of the crown, which is the county gaol. If a gaol be out of repair, or insufficient, &c. justices of peace, in their quarter sessions, may contract with workmen for the rebuilding or repairing it; and by their warrant order the sum agreed on for that purpose to be levied on the several hundreds and other divisions in the county by a just rate, 11 & 12 William III. c. 19. See PRISON.

GAOL-DELIVERY. The administration of justice being originally in the crown, in former times our kings in person rode through the realm once in seven years, to judge of and determine crimes and offences; afterwards justices in eyre were appointed; and since, justices of assise and gaol-delivery, &c. A commission of gaol-delivery is a patent in nature of a letter from the king to certain persons, appointing them his justices, or two or three of them, and authorising them to deliver his gaol at such a place of the prisoners in it: for which purpose it commands them to meet at such a place, at the time they themselves shall appoint; and informs them, that, for the same purpose, the king hath commanded his sheriff of the same county to bring all the prisoners of the gaol and their attachments before them at the day appointed. The justices of gaol-delivery are empowered by the common law to proceed upon indictments of felony, trespass, &c., and to order to execution or reprieve: they may likewise discharge such prisoners as on their trials are acquitted, and those against whom, on proclamation being made, no evidence has appeared: they have authority to try offenders for treason, and to punish many particular offences, by statute 2 Hawk. 24. 2 Hale's Hist. Placit. Cor. 35.

GAOLER, the keeper of a gaol or prison. Sheriffs are to make such gaolers for whom they will be answerable: but if there be any default in the gaoler, an action lies against him for an escape, &c., yet the sheriff is most usually charged.—2. Inst. 592. Where a gaoler kills a prisoner by hard usage, it is felony.—3. Inst. 52. No fee shall be taken by gaolers, but what is allowed by law and settled by the judges, who may determine petitions against their extortions, &c. 2 Geo. II. c. 22.

GAP. *s.* (from *gape.*) 1. An opening in a

broken fence (*Tusser*). 2. A breach (*Knolles*). 3. Any passage (*Dryden*). 4. An avenue; an open way (*Spenser*). 5. A hole; a deficiency (*More*). 6. Any interstice; a vacuity (*Swift*). 7. An opening of the mouth in speech during the pronunciation of two successive vowels (*Pope*). 8. *To stop a* GAP. To escape by some mean shift (*Swift*) 9. *To stand in the* GAP. To make defence.

GAP, an ancient town of France, in the department of the Upper Alps, and lately a bishop's see. It is seated on the small river Bene. Lat. 44. 34 N. Lon. 6. 10 E.

GAP-TOOTHED. *a.* (*gap* and *tooth.*) Having interstices between the teeth (*Dryden*).

To GAPE. *v. n.* (ȝeapan, Saxon.) 1. To open the mouth wide; to yawn (*Swift*). 2. To open the mouth for food, as a young bird (*Dryden*). 3. To desire earnestly; to crave (*Denham*). 4. To open in fissures or holes (*Shakspeare*). 5. To open with a breach (*Dryden*). 6. To open; to have an hiatus (*Dryden*). 7. To make a noise with open throat (*Roscommon*). 8. To stare with hope or expectation (*Hudibras*). 9. To stare with wonder (*Dryden*). 10. To stare irreverently (*Job*).

GA'PER. *s.* (from *gape.*) 1. One who opens his mouth. 2. One who stares foolishly. 3. One who longs or craves (*Carew*).

GAR, in Saxon, signifies a weapon: so *Eadgar* is a happy weapon (*Gibson*).

To GAR. *v a.* (*giera*, Islandick.) To cause; to make: obsolete (*Spenser*).

GAR-FISH, in ichthyology. See ESOX.

GARAMOND (Claude), a very eminent French engraver and letter-founder, was a native of Paris, where he died in 1561. He was the first who banished the Gothic, or black letter, from printing; for which he substituted the Roman letter. His types were very good, and particularly the small Roman, which was called by way of eminence Garamond's small Roman. By the command of Francis I., he cast the three Greek types employed in Robert Stephens's beautiful editions of the New Testament, and various Greek authors.

GARASSE (Francis), a French Jesuit, born at Angoulame, in 1585. He was a man of considerable imagination, but of a bad taste, and scurrilous in his style of writing. In 1625 he published a book entitled, A Summary of the principal Truths of the Christian Religion: this was attacked by the abbot of St. Cyran, and was the principal cause of the controversy between the Jesuits and Jansenists. It was censured by the Sorbonne; and the Jesuits prudently banished Garasse to one of their houses at a distance from Paris. He died of the plague, which he caught at Poictiers, while he was attending persons afflicted with that dreadful disorder; this happened in 1631.

GARB. *s.* (*garbe*, French.) 1. Dress; clothes; habit (*Milton*). 2. Fashion of dress (*Denham*). 3. Exteriour appearance (*Shakspeare*).

GA'RBAGE. *s.* (*garbear*, Spanish.) The bowels; the offal (*Roscommon*).

GA'RBEL. *s.* A plank next the keel of a ship.

GA'RBIDGE. GA'RBISH. *s.* Corrupted from *garbage* (*Mortimer*).

To GA'RBLE. *v. a* (*garbellare*, Italian.) To sift; to part; to separate the good from the bad (*Locke*).

GA'RBLER. *s.* (from *garble.*) He who separates one part from another (*Swift*).

GARCILASSO, or GARCIAS LASSO DE LA VEGA, an eminent Spanish poet, was descended from a noble family, and born at Toledo in 1500. He was educated under the eye of the emperor Charles V. who had a particular esteem for him. Having accompanied that prince in his expeditions, he received a wound of which he died, at Nice, in his 36th year. Garcilasso is one of those to whom the Spanish poetry owes the greatest obligations: he extended its bounds, and introduced many beauties. His works were printed at Naples in 1664, by the learned Sanctius.

GARCINIA, in botany, a genus of the class dodecandria, order monogynia. Calyx four-leaved, inferior; petals four; berry eight-seeded, crowned with the stigma. Four species; all East Indian trees. The two following are the species chiefly worthy of notice.

1. G. mangostana, Mangostan. A Java tree, about the size of a crab-apple, with ovate leaves, and one-flowered peduncles. The flower like that of a single rose; the fruit round, about the size of an orange, and very delicious. The Japanese suppose it the most elegant tree indigenous to their island, and hence it is largely cultivated in all their pleasure-gardens.

2. G. cambogia. Gamboge-tree. With elliptic leaves; solitary, terminal, and nearly sessile flowers. It is a native of India; and the gum-resin known among ourselves by the name of gamboge is obtained by wounding the bark.

GARÇON, or GARSOON, a French term, literally signifying a boy or male child any time before his marriage. It is also applied to certain inferior officers, among us called grooms.

GARD. *s.* (*garde*, French.) Wardship; care; custody.

GARD, a department of France, including part of the late province of Languedoc. Nismes is the episcopal town.

GARD (Pont du), a Roman aqueduct in France, nine miles N. E. of Nismes, erected, it is supposed, by Agrippa, in the time of Augustus. It is 160 feet in height, and consists of three bridges rising above each other, and uniting two craggy mountains. The highest of these bridges has six arches, of great blocks of stone, without cement; the centre one has eleven; and the lowest (under which flows the Gardon, an inconsiderable, but rapid river) has 36. Lewis XIV. when he repaired, in 1699, the damages which this stupendous work had sustained by time, caused a real bridge, over which passengers now pass, to be constructed by the side of the lower range of

arches. This aqueduct was built in order to convey to Nismes the water of the spring of Eure, which rises near Uzes.

GA'RDEN. *s.* (*garda*, Welsh; *jardin*, French.) 1. A piece of ground enclosed and cultivated, planted with herbs or fruits (*Bacon*). 2. A place particularly fruitful or delightful (*Shakspeare*). 3. GARDEN is often used in composition for *hortensis*, or belonging to a garden: as *garden*-mould, *garden*-tillage, *garden*-ware (*Mortimer*).

GARDEN. The general expanse or plot of ground throughout which the art or science of gardening is called into exertion, whether for the purpose of landscape, flowers or esculents. See the article GARDENING.

To GA'RDEN. *v. n.* (from the noun.) To cultivate a garden (*Ben Jonson*).

GA'RDENER. *s.* He that attends or cultivates gardens.

GARDENIA, in botany, a genus of the class pentandria, order monogynia. Corol twisted, berry inferior, two-celled, many-seeded; style elevated; two-lobed; segments of the calyx vertical. Nineteen species; chiefly East Indian plants, some spinous, others unarmed. From the bark of some species exudes a gum like gum elemi: the fruit of one species, G. dumetorum, thrown into the water intoxicates fishes.

GARDENING, the art or science of laying out a plot of ground for the purpose of landscape, esculents, or flowers.

GARDENING (Landscape), is justly entitled to be considered in the first place, as demanding very considerably more genius than either of the other divisions. It is now denominated over Europe, English or picturesque gardening; the former epithet being bestowed in consequence of the modern method of laying out pleasure-grounds having originated in our own country; and the latter in consequence of the principle upon which this method is founded, namely that of copying the style and character of the best painters of landscape, so as to transfer to nature and swell with actual life the well selected beauties which the taste of a correct artist introduces into a picture. General roughness of surface is the grand object in both; for it is hence chiefly that force and impression are derived. The painter indeed carries this principle even into his fore-ground, for he has no other means of exciting the idea of life and motion: but here the gardener has an advantage over the painter, for while the former smooths and polishes the lawn, by introducing into it his flocks and his herds he gives by their actual presence and motion that idea of life which the painter can only attain through the medium of roughness and abrupt contrasts of light and shade. In every other respect, however, they coincide most minutely: each equally disdains the line and the plummet, pursues an easy variety through all the countless shapes it assumes, and gives an actual existence to whatever ideal forms and combinations the artist may have derived from a survey of nature in remote and unconnected features of wildness or grandeur.

It is truly extraordinary that the Chinese, although they are utterly destitute of taste in painting, and have never studied the effect of sudden masses of light and shadow, appear to have evinced a true picturesque genius in their style of gardening. It is thus lord Macartney describes the emperor's palaces that lie scattered in the route from Pekin to Gehol. "They are constructed upon nearly the same plan and in the same taste. They front the south, and are usually situated on irregular ground near the basis of gentle hills, which, together with their adjoining valleys, are enclosed by high walls and laid out in parks and pleasure grounds with every possible attention to picturesque beauty. Whenever water can be brought into view it is not neglected; the distant hills are planted, cultivated, or left naked according to their accompaniments in the prospect. The wall is often concealed in a sunk fence, in order to give an idea of greater extent. A Chinese gardener is the painter of nature, and though totally ignorant of perspective as a science, produces the happiest effects by the management, or rather pencilling of distances, if I may use the expression, by relieving or keeping down the features of the scene; by contrasting trees of a bright with those of a dusky foliage, by bringing them forward, or throwing them back according to their bulk and their figure, and by introducing buildings of different dimensions, either heightened by strong colouring, or softened by simplicity and omission of ornament. There is no beauty of distribution, no feature of amenity, no reach of fancy which embellishes our pleasure grounds in England, which is not to be found here. Had China been accessible to Mr. Brown or Mr. Hamilton, I should have sworn they had drawn their happiest ideas from the rich sources which I have tasted this day; for in the course of a few hours I have enjoyed such vicissitudes of rural delight as I did not conceive could be felt out of England, being at different moments enchanted by scenes perfectly similar to those I had known there, to the magnificence of Stowe, the softer beauties of Woburn, and the fairy-land of Paine's-Hill."

In few words, modern picturesque or landscape gardening imparts to rural scenery what a noble and graceful deportment confers upon the human frame. It is something more than an imitative art; it is an endeavour to bestow on each individual reality, those beauties which judicious imitation would select from many, and combine in one fictitious representation.

Landscape-gardening, however, under the old English school was of a very different character. Its three grand divisions consisted of visto, parterre, and heath or wilderness, and they are well described by sir William Temple in his account of Moor-Park: the first was usually composed of a very broad gravel-walk garnished with rows of laurels for want of orange-trees, and was terminated at each end by a summer-house. The parterre or principal garden to which the visto led was equally devoid of simplicity. "This garden (says his lordship) is best to be square, encompassed with a stately arched-hedge, the arches to be upon carpenters work, over every arch a little belly enough to receive a cage of birds, and over every space, between the arches, some other little figure with broad plates of round coloured glass, gilt for the sun to play upon." The wilderness with which the garden (properly so called) terminated, was, upon the whole, as formal, costly and unnatural. Yet the common sense of our own countrymen seems frequently to have opposed this absurd and graceless fiction even when most prevalent. Lord Bacon does not appear to have yielded to it with his whole heart; and in his description of the

heath as he denominates it, he has almost anticipated the ornamental scenery in general use in the present day. The genius of Milton soared equally above the trammels of fashion and corrupt taste: and what his masterly hand delineated as the garden of Paradise, was the basis upon which the fathers of the new system of English gardening, Kent and Brown, erected the whole of their principles.

The chief object at present pursued, and which ever ought to be pursued, in the construction of picturesque garden-scenery, is to follow nature and not to force her: to catch her own local views and intentions, and to perfect them: but by no means to banish or exchange them for views and intentions she may exhibit in other situations, even though these last may be more magnificent or imposing, in every respect endeavouring to intermix unity with utility, and utility with proportion or harmony of parts to the whole.

In doing this our chief attention is of course to be paid to the fore-ground; which is in general not merely of the highest importance, but the part which is usually most at the disposal of a proprietor. Wherever a man stands, the contiguous objects immediately before him form a fore-ground to the scene he is looking at; and by the fore-ground how much is the general prospect affected: there are few who delight in landscape who have not perceived that the general harmony of a scene results from a due proportion of its parts; but the greater distances, and especially the back-ground, are seldom within the power of art. How then may art, thus limited in the extent of her dominion, attempt to harmonize the whole scene? The answer is, by a judicious adaptation and disposition of the objects through which the eye beholds it. A path is a series of fore-grounds; and to adapt each part of this to the various combinations of the distant objects which always result from change of place or aspect is the proper business of art: to produce a selection of well adapted greens which shall contrast, or mix their colouring into it: such interruptions as may frequently give the charm of renewal to what we have been for a time deprived of; the absolutely unintervening foliage of shrubbery beneath the eye, and the shade of forest foliage above it; in which latter case the best portions of the distant scene may be selected and beheld from between the stems of the trees, which should be so situated as sometimes by affording lateral limits to reduce the view even to the strictest rules of composition; and, thus, from the varieties of the fore-ground the general, scene is also perpetually varied.

Distant scenery, however, can never be viewed in parts, but only altogether; and hence nothing can be more absurd than attempts which we often meet with, of counteracting the uniform operation of aerial perspective, by spotting the remote hills with little circumscribed clumps of dark foliage, and to intersect by regular fences what is formed to please only by the singleness and majesty of the whole.

These principles are general, and they apply to all the subjects of picturesque gardening, and their due employment and appropriation: to paths and roads, to wood and water, to fences and buildings: the chief theatre of which is still the fore-ground, the pivot, indeed, on which the life and motion of the entire scenery seem to turn.

There are some features in the garden scene that are lost if intermixed with its general range, and hence can only be seen to full advantage by being contemplated alone. The more strictly **Ornamental**, or **Flower-garden**, is of this character: which should, consequently, stand apart from the general scene, and be confined to some glade or other sheltered seclusion. The form and disposition of its beds, though very irregular, should not appear broken into too many round and disjointed patches, but only seem to interrupt the green sward walks, which, like the mazy herbage, that in forest scenes usually surrounds the underwood tufts of thorn, wind carelessly among them, and running from side to side through every part of the scene, frequently meet the gravel path that leads round the whole. Here architectural forms, emblematic of the virtues or the arts, the busts of the good and the wise, the votive tablets of friendship or gratitude, may often be gracefully and successfully introduced.

Still more remote should be the **Esculent** or **Kitchen-garden**. This should generally be situated on one side of the house, and near the stables, that dung may be easily conveyed into it; having under the wall borders which ought to be eight or ten feet broad. Upon those borders exposed to the south many sorts of early plants may be sown; while upon those exposed to the north we may have late crops; taking care, however, not to plant any sort of deep-rooting plants, especially beans and peas, too near the fruit-trees. We should next proceed to divide the ground into sections: the best figures for these is a square or an oblong, if the ground will admit of it; otherwise they may be of that shape which will be most advantageous to the ground: their size should be proportioned to the garden; if they be too small, your ground will be lost in walks, and the beds being enclosed by espaliers of fruit-trees, the plants will draw up slender, for want of a more open exposure. The walks should also be determined on the same scale: these in a small garden should be six feet broad, but in a larger one ten; and on each side of the walk there should be allowed a border three or four feet wide between it and the espalier, in which may be sown some small salads, or other herbs that do not take deep root, or continue long: but the larger divisions should not be sown or planted with the same crop two years together. In one of these divisions, situated nearest to the stables, and best defended from the cold winds, should be the hot-beds for early cucumbers, melons, &c. and to these there should be a passage from the stables, and a gate through which a small cart may enter. The most important points of general culture consist in well digging and manuring the soil, giving a proper distance to each plant, according to their different growths, as also in keeping them clear from weeds; for which last purpose we should always observe to keep our dung-hills clear from them; since if this is not done, their seeds will be constantly brought in, and spread with the dung about the garden.

Those who garden on a large scale ought to be provided with every convenience and facility. A proper spot should be appropriated for a range of hot-beds; and another for hot-houses and green-houses. In gardens of this magnitude we expect also to meet with such out-buildings, as a tool-house, and a room for the preservation of bulbs, seeds, and herbs. In the tool-house we expect to meet with gardening implements of every kind. Even in gardening upon a small scale, a choice of implements is equally desirable and profitable: it is the best mode of economizing time and labour,

and almost ensures to us that we shall have our work well done. If water can be introduced and kept clean, with verdant banks around it, we should certainly avail ourselves of such an advantage: the most central situation will always be found the most convenient. It should be fed from a pond rather than from a spring.

Plants are propagated by seeds, suckers, slips, offsets, divisions, cuttings, layers and grafts. Some are propagable by only one or two of these methods, and others by almost all of them. Under the separate articles allotted to the various plants that constitute the province of gardening, we have endeavoured to point out the best mode of management and propagation for each; and to these articles we shall refer the reader, without adding to the bulk of our work by a long and unnecessary recapitulation.

The following tables however will be found highly useful, as comprising the whole scope, and principles and practise of horticulture, in a bird's eye view, and we insert them accordingly:—

Table of the number of crops required of each sort of vegetable, in order to have a regular succession through the year; and also of the time of sowing and planting them.

Kitchen-garden plants, seeds, and roots.

	No. of crops.	*Time of sowing, &c.*
Alisander	2	Mar. Aug.
Angelica	2	Mar. Aug.
Artichoke	1	Mar. or Apr.
Asparagus	1	Mar. or Apr.
— forced	5	Oct. Nov. Dec. Jan. Feb.
— in autumn	1	July, if cut down
Balm	1	Mar. or Apr.
Basil	1	Mar. or Apr.
Beans, early	5	Oct. Jan. Feb. Mar. July
— late	4	Feb. Mar. Apr. July
Beets	1	Feb. or Mar.
Borcole, or kale	3	Mar. Apr. June
— Anjou	2	May, June
Borage	1	Feb. or Mar.
Brocoli	4	Mar. Apr. May, June
Burnet	1	Mar. or Apr.
Cabbages, early	1	Aug.
— late	4	Feb. Mar. May, June
— red	3	Feb. Mar. June
— Savoy	3	Mar. May, June
— for cattle	2	May, June
— for seed	1	Oct. or Nov.
Cabbage-turnip	2	May, June
Camomile	1	Mar. or Apr.
Capsicums	1	Mar. or Apr.
Carrots to draw young	3	Jan. Apr. July
— principal crop	1	Feb. or Mar.
— for seed	1	Feb.
Cauliflowers	4	Aug. Feb. Mar. May
Celery	5	Feb. Mar. Apr. May, June
Chardons	1	Mar. or Apr.
Chervil	2	Mar. Aug.
Cives	1	Mar. or Apr.
Clary	1	Mar. or Apr.
Coleseed	1	June or July
Coleworts	2	Feb. June or July
Corn-sallad	2	Mar. Aug.
Cress, for seed	1	Mar. or Apr.
— for sallad		Mar. to Sept.
— on hotbeds		Oct. to Mar.
Cucumbers	5	Jan. Feb. Mar. Apr. May
— on hotbeds	3	Jan. Feb. Mar.
— for bell-glasses	1	Apr.
— open ground	1	May or June
Dill	1	Mar. or Apr.
Endive	4	Apr. May, June, July
Escalions	1	Jan. or Feb.
Eschalot	2	Feb. Sept.
Fennel	2	Feb. Aug.
Finochio	4	Apr. May, June, July
Garlic	2	Feb. Sept.
Horse-radish	1	Feb. or Mar.
Hyssop	1	Mar. or Apr.
Jerusalem artichokes	1	Feb. or Mar.
Kidney-beans	5	Mar. Apr. May, June, July
— Runners	2	Apr. May
Lavender	1	May or June
Leeks	1	Feb. or Mar.
Lettuces	7	Feb. to Aug.
Marjoram	2	Mar. Apr.
Marygolds	1	Feb. or Apr.
Melons	3	Feb. Mar. Apr.
— for autumn	1	May
Mint	1	Mar. or Apr.
Mushrooms	2	Mar. Sept.
Mustard, for seed	1	Mar. or Apr.
— for sallad		Mar. to Sept.
— on hotbeds		Oct. to Mar.
Nasturtiums	1	Mar. or Apr.
Onions, to draw young	4	Jan. Apr. May, July
— principal crop	1	Feb. or Mar.
— for seed	1	Feb. or Mar.
— Welsh	2	July, Aug.
Parsley	3	Feb. Mar. July
— large-rooted	2	Feb. Apr
Parsneps	2	Feb. Mar. or Apr.
Peas, hotspurs	5	Oct. Jan. Feb. July, Aug.
— Marrowfats	5	Feb. Mar. Apr. May, June
Pennyroyal	1	Mar. or Apr.
Potatoes	3	Feb. Mar. Apr.
— on hotbeds	1	Jan. or Feb.
Purslane	3	Mar. Apr. May
Radishes	9	Jan. to Aug. and Nov.
— on hotbeds	2	Jan. Feb.
— for sallad		Mar. to Sept.
— for seed	1	May
Rampion	1	Mar. or Apr.
Rape	1	June or July
— for sallad		Mar. to Sept.
Rocambole	2	Feb. Sept.
Rosemary	1	May, or June
Rue	1	Mar. or Apr.
Sage	1	Mar. or Apr.
Salsafy	1	Mar. or Apr.
Savory	1	Mar. or Apr.
Savoy cabbage	3	Mar. May, June
Scorzonera	1	Mar. or Apr.
Scotch kale	3	Mar. Apr. June.
Sea kale	1	Mar. or Apr.
Skirrets	1	Mar. or Apr.
Sorrel	2	Mar. Aug.
Spinach	6	Feb. to July
— Winter	2	July, Aug. or Sept.
Tansey	1	Mar. or Sept.
Tarragon	1	Mar. or Sept.
Thyme	1	Mar. or Apr.
Tomatoes	1	Mar. or Apr.
Turneps	6	Mar. to Aug.
— for seed	1	Feb.
Turnep-cabbage	2	May, June
Turnep-radish	2	June, July
Water-cress	2	Mar. Sept.

Table of the flowers, shrubs, and trees usually cultivated, and of the time and mode of their propagation.

GARDENING.

§ 1. *Tender annual flowers,*

To be sown on a strong hot-bed the last week in February, or first in March, transplanted afterwards upon another at four inches distance, then planted in small pots in May, afterwards in larger, and at the end of June placed in the open air.

1. Amaranths
2. Balsams
3. Cockscombs
4. Egg-plants
5. Glo. amaranthus
6. Humble-plant
7. Ice-plant
8. Sensitive-plant
9. Stramoniums.

§ 2. *Annual flowers,*

To be sown on a moderate hot-bed in March or April, transplanted afterwards before they are too thick, in rich light earth, and covered with mats, and in a month or six weeks into pots, or borders of the flower-garden.

1. African marygolds
2. Blue browallia
3. Capsicums
4. Cape marygolds
5. Chinese asters
6. Chinese or Ind. pinks
7. Chrysanthemums
8. French marygolds
9. Marvel of Peru
10. Mignonette
11. Nolana
12. Palma Christi
13. Stock-Julyflowers
14. Sultan (yellow)
15. Zinnias.

As you sow them, fix numbers to them corresponding with these, and you will readily know each sort when they appear.

§ 3. *Hardy annual flowers,*

To be sown in March or April on the borders of the flower-garden. Hollow the earth out in form of a little bason, about a foot over, and two inches deep; draw a circle near the edge half an inch deep, and drop a few seeds in it; thin them soon after they appear, and leave them at six inches distance, but the large sorts wider. In dry weather they will want frequent watering. Gather the seeds as they ripen, and you may save the expence of buying another season.

1. Adonis flower*
2. Alkekengi
3. Alysson
4. Amaranths
5. Amethystea
6. Balm (Moldavian)
7. Belvidere
8. Candy tuft*
9. Catchfly (Lobes)*
10. Caterpillar-trefoil.
11. Clary (red & white)
12. Convolvulus
13. Cornbottles*
14. Cucumber (spurting)
15. Fumatory (yellow)
16. Hedgehog-trefoil
17. Honeywort
18. Indian corn
19. Ketmia
20. Larkspurs*
21. Lavateras
22. Lupines
23. Mallows
24. Mignonette
25. Nasturtiums*
26. Nigella, or devil in a bush*
27. Panseys, or hearts-ease
28. Peas (sweet-scented)*
29. Persicaria*
30. Poppies*
31. Safflower, or bastard saffron
32. Snail-trefoil
33. Snap-dragon
34. Stock-Julyflowers*
35. Sun-flowers
36. Sweet sultans
37. Tobacco
38. Venus's looking-glass*
39. Venus's navelwort
40. Xeranthemums.

Those marked thus * being very hardy may be sown the beginning of February, to flower early.

In July sow again annual stock, candy tuft, convolvulus minor, cornbottles, Lobel's catchfly, and yellow lupines, and they will flower until the frost kills them.

§ 4. *Biennial flowers,*

To be sown in March or April in beds very thin; as soon as the plants touch one another, thin them, and leave them at four or six inches asunder; those you draw out, plant at the same distance. In July transplant them all upon beds, at eight inches asunder; there they must remain till the end of September, when they must be planted upon the borders of the flower-garden, and they will produce their flowers the next summer, after which they will perfect their seeds and die.

1. Canterbury bell
2. Colutea (Æthiopian)
3. French honeysuckles
4. Globe thistle
5. Honesty, or moon wort
6. Mallow (tree)
7. Poppy (yellow horned)
8. Rocket
9. Scabious
10. Stock-Julyflower
11. Sweet Williams
12. Tree-primrose
13. Wall-flowers.

§ 5. *Perennial-rooted flowers,*

Which if sown in the same manner as the biennials, and transplanted into the borders of the flower-garden, will continue for several years.

1. Alysson
2. Auriculas
3. Bee larkspurs
4. Campanulas
5. Carnations
6. Columbines
7. Flax
8. Fox-gloves
9. Hawkweeds
10. Hollyhocks
11. Ox-eye daisy
12. Peas (everlasting)
13. Pinks
14. Polyanthuses
15. Rhubarb
16. Rose-campion
17. Snap-dragons
18. Valerian
19. Greek valerian.

§ 6. *Perennial-rooted flowers,*

Which are propagated by dividing their roots in spring, in March or April; or in the autumn, in September.

1. Adonis flower
2. Anemones
3. Asphodel
4. Asters
5. Bachelors-button
6. Bean-caper
7. Bears-breech
8. Borage
9. Bugloss
10. Campanulas
11. Campion
12. Cardinal flower
13. Christmas rose
14. Cowslip
15. Cranesbill
16. Crowfoot
17. Daisies
18. Dog-tooth violet
19. Dragons
20. Dropwort
21. Eternal flower
22. Fennel-giant
23. Feverfew
24. Flag
25. Foxglove
26. Fraxinellas
27. Fumatory
28. Garlic
29. Gentianella
30. Golden locks
31. Golden rod
32. Greek valerian
33. Hellibore
34. Hepatica
35. Herb-bennet
36. Houseleek
37. Ladies-mantle
38. Ladies-slipper
39. Ladies-smock
40. Lily of the valley
41. Lion's tail
42. London-pride
43. Loosestrife
44. Lupine
45. Lychnis
46. Lychnidea
47. Madwort
48. Marsh-Marygold
49. Meadow sweet
50. Milfoil
51. Milk-vetch
52. Mint
53. Mouth-mullen
54. Navelwort
55. Peony
56. Pilewort
57. Plantain
58. Primrose
59. Ragged-Robin
60. Ranunculuses
61. Reed
62. Rhubarb
63. Saxifrage
64. Skullcap
65. Sneezewort
66. Side-saddle flower
67. Soapwort
68. Solomon's seal
69. Spiderwort
70. Spurge
71. Stonecrop
72. Sunflower
73. Swallow-wort
74. Thrift

75. Throatwort
76. Toadflax
77. True love
78. Valerian
79. Vervaina
80. Veronica
81. Violet
82. Viper's-bugloss
83. Wake robin
84. Willow-herb
85. Wolfsbane
86. Wormwood and some others, but with very little beauty to recommend them.

§ 7. *Bulbous and tuberous-rooted flowers.*

1. Aconites
2. Amaryllises
3. Anemones
4. Bulbocodiums
5. Cornflags
6. Crocuses
7. Crown-imperials
8. Cyclamens
9. Daffodils
10. Garlic Moly
11. Hyacinths
12. Jonquils
13. Irises
14. Lilies
15. Martagons
16. Narcissuses
17. Pancratiums
18. Polyanthus-Narcissus
19. Ranunculuses
20. Sisyrinchiums
21. Snowdrops
22. Star of Bethlehem
23. Tuberoses
24. Tulips.

To be taken up in April, May, and June, as soon as their leaves are withered, and planted again in September or October, but their offsets in August.

The ranunculuses and anemones not to be planted till February.

The seed to be sown in February in boxes.

§ 8. *Bulbous-rooted flowers.*

1. Amaryllises
2. Colchicums
3. Crocuses
4. Cyclamens
5. Daffodil (sea)
6. Lily (Bellaflonna)
7. — (Guernsey)
8. Saffron.

These flower in autumn. They require to be planted in August, and to be taken up in April or May, as soon as their leaves are decayed, but their offsets in July.

§ 9. *Deciduous flowering-shrubs and ornamental trees,*

To be planted in March, April, September and October.

1. Acacia (rose-flowering)
2. Almond trees
3. Allspice
4. Althæas
5. Ash-tree (mountain)
6. Annona, or papaw-tree
7. Azaleas
8. Berberry-trees
9. Bignonia, or Trumpet-flower
10. Bladder sena
11. Bramble
12. Buckthorn
13. Caragana
14. Cassioberry bush
15. Catalpa, or Trumpet flower
16. Ceanothus
17. Cephalanthus
18. Cherry-trees
19. Cinquefoil (shrubby)
20. Clethra
21. Cornel-tree
22. Crab tree
23. [illegible]
24. [illegible]rilla
25. [illegible]wood
26. [illegible]thergilla
27. Gingo, or maiden-hair-tree
28. Gueldres rose
29. Halesia
30 Hamamelis
31. Hawthorn
32. Hickery-nut
33. Honeysuckles
34. Honeysuckle (upright)
35. Hypericums
36. Jasmin
37. Jesuit's bark tree (false)
38. Indigo (bastard)
39. Ironwood-tree
40. Judas-tree
41. Kidney-bean-tree
42. Laburnums
43. Lac, or varnish-tree
44. Leatherwood
45. Lilacs
46. Mezereons
47. Nightshades
48. Olive-tree (wild)
49. Passion-flower
50. Peach-trees
51. Periploca, or Virginian silk
52. Plum-trees
53. Poison-trees
54. Pomegranate-tree
55. Privet
56. Raspberry
57. Restharrow
58. Rose-tree, 80 varieties
59. St. Peter's wort
60. Sassafras-tree
61. Service-tree
62. Snow-drop, or Fringe-tree
63. Spindle-tree
64. Spiræas
65. Sumach-trees
66. Syringas
67. Tamarisk
68. Tea-tree
69. Tooth-ach-tree
70. Traveller's joy
71. Tupelo-tree
72. Viburnums
73. Weeping willow-tree.

§ 10. *Deciduous forest-trees,*

To be planted from the middle of February till the beginning of April, and from September till December.

1. Acacias
2. Alders
3. Ash trees
4. Beech trees
5. Birch trees
6. Chesnut trees
7. Crab trees
8. Cypress
9. Elder trees
10. Elm trees
11. Hickery nut
12. Hornbeams
13. Horse chesnuts
14. Larch trees
15. Lime trees
16. Magnolias
17. Maple trees
18. Nettle trees
19. Oak trees
20. Plane trees
21. Poplar trees
22. Tulip trees
23. Walnut trees
24. Willow trees.

§ 11. *Evergreen flowering shrubs and ornamental trees,*

To be planted in March, April, September and October.

1. Alaternus
2. Andromeda
3. Arbor vitæ
4. Arbutus
5. Bay tree
6. Bignonia
7. Box
8. Broom
9. Cassine, or South sea tea tree
10. Cistus, or rock rose
11. Crab tree
12. Cytisus (hairy evergreen)
13. Groundsel tree
14. Holly trees
15. Honeysuckles
16. Juniper
17. Ivy
18. Kalmias
19. Lavenders
20. Laurels
21. Laurustinuses
22. Magnolia
23. Phillyreas
24. Privet
25. Purslane tree
26. Pyracantha
27. Rhododendron
28. Rose tree
29. Rosemary
30. Rue
31. Savin
32. Spindle tree
33. Sweet brier
34. Tea trees
35. Widow wail.

§ 12. *Evergreen forest trees,*

To be planted from the middle of February till the end of April, and from September till December.

1. Cedar trees
2. Cork trees
3. Cypress trees
4. Fir trees
5. Oak trees
6. Pine trees
7. Yew trees.

§ 13. *Fruit trees and fruits,*

To be planted in February, March, October and November.

1. Almonds
2. Apples
3. Apricots
4. Berberries
5. Cherries
6. Crab trees
7. Currants
8. Figs
9. Filberts
10. Gooseberries
11. Medlars
12. Nectarines
13. Nut trees
14. Peaches
15. Pears
16. Plums

17. Quinces
18. Raspberries
19. Services
20. Vines
21. Walnuts.

The following method may be taken for preserving the blossoms of fruit trees in spring. Procure some sheep hurdles, made of hazel or willow branches, about two or three feet higher than the walls. At spring, just before the blossom of the fruit-trees begin to open, place these before the trees, and fasten them in windy weather with stakes, and by their being taller than the walls are high, they may be set sloping about two feet from the bottom of the walls, which will keep them steady.

When the fruit is set, and entirely out of danger, take them quite away, and by keeping them in a dry place they will last many years, and will be always worth one third of the first cost, for lighting of fires, when unfit for any other use. In an experiment that was made, the hurdles were placed before the trees in December; they also defended a crop of peas. It is possible that vine might also be thus defended in the spring, and come forwarder; at least it is worth trying where the walls are not too high.

§ 14. *Hardy greenhouse plants*,

To be planted against a south wall, in the open ground, the roots covered with tan or long litter. These will not be killed except in very severe frosts, and then they generally shoot up afresh from their roots.

By this method, many curious plants, formerly only kept in greenhouses, will now ornament the walls, where they will appear in greater vigour and beauty, and many may produce both flowers and fruit, which they will not do when confined in pots in a greenhouse.

1. Bay tree
   — Blue berried Carolinian
2. Boxthorn
   — (African)
3. Broom
   — (Sturry)
   — (Montpelier)
4. Cedar tree
   — (Bermudian)
   — (Goa)
5. Fig (Indian)
6. Heath
   — (Many flowered)
   — (Mediterranean)
   — (Three flowered)
7. Jasmine (Catalonian)
8. Laurel (Alexandrian)
9. Myrtle
   — (Broad leaved Roman)
   — (Double flowered)
   Myrtle (Portugal)
   — (Upright Italian)
10. Magnolia (Evergreen)
11. Oleander
    — (Red)
    — (White)
12. Olive tree
    — (Box leaved)
    — (Province)
13. Pistachia nut tree
14. Pomegranate (Dwarf)
15. Ragwort (Sea)
16. Rose tree (Chinese)
17. Rosemary (Silver leaves)
18. Sophora
    — Small leaved Otaheite
19. Strawberry tree
20. Tea tree (green)
21. Winter cherry.

For the particular operations in esculent and flower gardening, see the articles PLANTING, PRUNING, GRAFTING, INARCHING, INOCULATING. See also HUSBANDRY, GREEN-HOUSE, HOT-HOUSE, and the respective names of the different plants referred to, in their systematic arrangement.

GARDINER (Stephen), bishop of Winchester, and lord chancellor of England, born at Bury St. Edmunds in Suffolk, natural son to Richard Woodville, brother to queen Elizabeth wife to Edward IV. was learned in the canon and civil laws, and in divinity. He signed the divorce of Henry VIII. from Katharine of Spain, abjured the pope's supremacy, and wrote De vera et falsa obedientia, in behalf of the king. yet in Edward's reign he opposed the reformation, and was punished with imprisonment; but queen Mary coming to the throne, she enlarged him. He drew up the articles of marriage between the queen and Philip of Spain, which were very advantageous to England. He was violent against the reformers; but on his death-bed was dissatisfied with his life, and often repeated these words: Erravi cum Petro, sed non flevi cum Petro. He died in 1555.

GARE. *s.* Coarse wool on the legs of sheep.

GARGA'REY, in ornithology. See ANAS.

GA'RGARISM. *s.* (γαργαρισμος.) A liquid medicine to wash the mouth with (*Bacon*).

To GA'RGARIZE. *v. a.* (γαργαριζω.) To wash the mouth with medicated liquors (*Hol.*).

GARGET. In the manage, a tumour and inflammation in the head of horses and other quadrupeds, commencing in the eyes and lips, and extending to the gums and tongue. It is sometimes contagious: but generally yields without difficulty to topical bleedings, especially of the sublingual vein, and cathartics in conjunction.

To GA'RGLE. *v. a.* (*gargouiller*, French.) 1. To wash the throat with some liquor not suffered immediately to descend (*Harvey*). 2. To warble; to play in the throat (*Waller*).

GARGLE, in medicine. (*gargarismum, gargarisma.*) A fluid preparation to wash the throat with.

GARGLE, among horned cattle, a disease proceeding from an indurated tumour of the dew-lap, progressively extending to the breast and throat. It appears to be of a scrophulous, indolent nature, and yields to rowels and other local stimulants.

GA'RLAND. *s.* (*garlande*, French.) 1. A wreath of branches or flowers (*Sidney*). 2. The top; the principal (*Shakspeare*). 3. A collar of ropes wound about the head of the mainmast of a ship, to keep the shrouds from galling (*Chambers*).

GARLICK, in botany. See ALLIUM.

GARLICK PEAR. See CRATŒVA.

GA'RLICKEATER. *s.* (*garlic* and *eat.*) A mean fellow (*Shakspeare*).

GA'RMENT. *s.* (*guarniment*, old French.) Any thing by which the body is covered.

GA'RNER. *s.* (*grenier*, French.) A place in which thrashed grain is stored up (*Dr.*).

To GA'RNER. *v. a.* (from the noun.) To store as in garners (*Shakspeare*).

GA'RNET. *s.* (*garnato*, Italian.) A gem of a middle degree of hardness, between the sapphire and the common crystal, whose colour is ever of a strong red. See GEMMA.

GARNETT (Thomas, M.D.), an ingenious physician and philosopher, was born in a village in Westmorland, and like most men who have become eminent by their talents, he sprang from the middle class of society. His

father is the proprietor and cultivator of a small estate near Kirkby-Lonsdale. Prompted by his son's evident superiority over his little playmates, he resolved to spare no expence in his education, and accordingly, when he had passed the usual time at a country grammar-school, he was placed under the care of Mr. Dawson, of Sedberg, in Yorkshire, a gentleman of well-known mathematical abilities. Four years were here spent in the closest study, at the expiration of which period, determining on the pursuit of medicine, he proceeded to Edinburgh, and became a pupil of Dr. Brown, whose system he ever after defended and acted upon. A residence of several years procured him a degree. He then visited London, and studied surgery with considerable attention. Conceiving himself qualified to enter into the practice of his profession, and an opportunity offering by the death of Dr. Wilson, he began his public career at Harrogate, in Yorkshire. To those who have observed the means which the medical men of this place find themselves under the necessity of using, to obtain employment, it will not appear surprising, that the delicate mind of Dr. Garnett received severe and frequent shocks, until, the irksomeness of his situation becoming insupportable, although lucrative, he was compelled to abandon it. He now formed a design of emigrating to America, but the persuasion of his friends prevailed upon him to relinquish this scheme. It being suggested in Liverpool, that a course of lectures on chemistry and experimental philosophy would, in all probability, be well received, he embraced the idea, and was gratified by a success exceeding his most sanguine expectations. The neighbouring town of Manchester was the next theatre for the display of his knowledge, and he there repeated, with the highest approbation, the course he had given at Liverpool. Encouraged by the flattering reception he met with, he became a candidate, and a successful one, for the lectureship of Anderson's Institution, in Glasgow. The reputation which he acquired, while in this situation, induced the managers of the Royal Institution to offer him the place of lecturer in physics and philosophy, a selection which was the more honourable to Dr. Garnett, as it was entirely unsolicited, and unexpected by him. The temptation was too strong to be resisted. He acceded to the proposed terms, and, coming immediately to London, delivered his lectures during two seasons, to a crowded and brilliant audience. The publicity he had thus gained, added to other circumstances, influenced him to resign his seat in the Institution; and the lease of a house in Great Marlborough-street being on sale, he bought it, built a large and convenient lecture-room, purchased a quantity of philosophical apparatus, and had the pleasure to see his forms filled with pupils. In the spring of 1802, he began a new course, and was advancing towards its close, when ill-health, for a [illegible] his labours. Resolutely strug-[illegible] disease, in a few days he resumed his chair, and gave several lectures, when suffering under the severest indisposition; but, at length, his feeble limbs refused to obey the dictates of his vigorous mind, and he was obliged to remain in his own apartment. His disorder every instant assumed a more serious aspect. The medical gentlemen, who attended him, declared it to be a typhus fever, caught in the gratuitous exercise of his profession, and increased by anxiety and over-exertion; and, in spite of every effort of skill, and every care of affection, on the 28th of June 1802, this amiable man expired, in his 35th year.

As an author, Dr. Garnett is known to the world by his Tour through Scotland; by his Analysis of the Mineral Waters at Harrogate, Moffat, Horley Green, &c. by his Lecture on Health; his Annals of Philosophy; and by a number of papers inserted in the Memoirs of the Medical Society of London, the Royal Irish Academy, and the Literary and Philosophical Society of Manchester, of which bodies he was a member. The Monthly Magazine also is indebted to him for several valuable communications.

As a lecturer, he was entitled to every praise for complete knowledge of his subject, although, in explaining it, he did not use the rhetorical action and declamation, which so frequently impose upon the world, and which, in matters of science, are perhaps worse than useless. What he said was easily apprehended, and he never allowed an opportunity to escape of illustrating and confirming by experiment what he had advanced in theory.

As a man, he was generally admired and beloved. Active and energetic, yet mild and unassuming, the superiority of his mind was disguised by the simplicity and suavity of his manners. His countenance was open and intelligent, sometimes highly animated, but too often overcast with an expression of melancholy, which those who were so happy as to be his friends must ever lament should have a cause for existence.

Before he quitted Harrogate, he married a Miss Cleveland, a charming woman, who was so fondly attached to him, as to participate in his studies. From the day of their union, it was her endeavour to assimilate her mind to his. She attended all his lectures, paid particular attention to those subjects on which she found he was most interested, and even qualified herself to assist him in the correction of his manuscripts. He returned her affection with equal ardour, and they seemed made for each other, when in giving him a second daughter, she expired in his arms. After this a wish to provide for his children roused him to great exertion, and this, together with much anxiety of mind, soon produced the fatal disorder which terminated his useful labours, and left his infant daughters orphans to be provided for by the known generosity of the British public.

GARNIER (Robert), a French tragic poet, was born at Ferté Bernard, in the province of

Maine, in 1534; and died in 1590. His dramatic works were printed at Lyons in 1 vol. 12mo. 1597.

GA'RNISH. *v. a.* (*garnir*, French.) 1. To decorate with ornamental appendages (*Sidney*). 2. To embellish a dish with something laid round it (*Dryden*). 3. To fit with fetters. A cant term.

Ga'rnish. *s.* (from the verb.) 1. Ornament; decoration; embellishment (*Shaksp.*). 2. Things strewed round a dish. 3. (In gaols.) Fetters.

GA'RNISHMENT. *s.* (from *garnish.*) Ornament; embellishment (*Wotton*).

GA'RNITURE. *s.* (from *garnish.*) Furniture; ornament (*Granville*).

GARONNE, a river of France, which rises in the Pyrenees, on the borders of Arragon, in Spain, and joining with the Dordogne about 12 miles below Bourdeaux, changes its name to Gironde.

Garonne (Upper), a department of France, which takes its name from the river that runs through it. It contains part of the late province of Languedoc. Toulouse is the capital.

GAROU BARK. See Thymalæa.

GA'ROUS. *a.* (from *garum*, Latin.) Resembling pickle made of fish (*Brown*).

GA'RRAN. *s.* (Erse.) A small horse; a hobby; a galloway (*Temple*).

GA'RRET. *s.* (*garite*, the tower of a citadel, French.) A room on the highest floor of the house.

GARRETTE'ER. *s.* (from *garret.*) An inhabitant of a garret.

GARRICK (David), a celebrated English actor, was descended from a French family, who, being protestants, fled to England on the revocation of the edict of Nantes. His father, Peter Garrick, was a captain in the army, and generally resided at Litchfield; but being on a recconnoitring party at Hereford, David was born there in 1716. He received his education, partly at the grammar-school at Litchfield, and partly under the celebrated Dr. Johnson, with whom he came to London in 1735. He was for some time under Mr. Colson, an eminent mathematician, and afterwards went into partnership with his brother in the wine trade. This business he soon quitted for the stage. His first attempt was made at Ipswich, in the summer of 1741, under the assumed name of Lyddal; and having been received there with great applause, he ventured soon after to make his appearance at the theatre in Goodman's fields, in the character of Richard. The theatres of Covent-garden and Drury-lane were quickly deserted, and Goodman's fields became the resort of people of fashion, till that theatre was shut up. Garrick then made an engagement with Fleetwood, the patentee of Drury-lane. In the summer of 1742 he performed at Dublin to such full houses, that the heat of the weather and the crowds occasioned a fever, which was fatal to many, and was called Garrick's fever. In 1747 he became joint-patentee of Drury-lane with Mr. Lacey. In 1749 he married mademoiselle Viletti. In 1763 he and Mrs. Garrick made a visit to Italy, both of them being in an indifferent state of health. Visiting Paris on his road, he saw the celebrated mademoiselle Clairon. At this time mademoiselle Dumesnil was the favourite actress in that city; but Mr. Garrick ventured to foretel that Clairon would excel all her competitors, and the result verified the prediction. He returned to England in 1765, and in 1766 quitted the stage. He died at his house in the Adelphi in 1779. He wrote several dramatic pieces, and a great number of prologues and epilogues, besides reviving several old plays. A monument was lately erected to his memory in Westminster-abbey.

Mr. Garrick continued in the unmolested enjoyment of his fame and unrivalled excellence to the moment of his retirement. His universality of excellence was never once attacked by competition. Tragedy, comedy, and farce; the lover and the hero, the jealous husband who suspects his wife without cause, and the thoughtless lively rake who attacks without design, were all alike his own. Rage and ridicule, doubt and despair, transport and tenderness, compassion and contempt; love, jealousy, fear, fury, and simplicity; all took in turn possession of his features, while each of them in turn appeared to be the whole possessor of his heart. In short, Nature, the mistress from whom alone this great performer borrowed all his lessons, being in herself inexhaustible, this her darling son, marked out for her truest representative, found an unlimited scope for change and diversity in his manner of copying from her various productions. There is one part of theatrical conduct which ought unquestionably to be recorded to Mr. Garrick's honour, since the cause of virtue and morality, and the formation of public manners, are considerably dependent upon it; and that is, the zeal with which he aimed to banish from the stage all those plays which carry with them an immoral tendency, and to prune from those which do not absolutely, on the whole, promote the interests of vice, such scenes of licentiousness and liberty, as a redundancy of wit and too great liveliness of imagination have induced some of our comic writers to indulge themselves in, and which the sympathetic disposition of our age of gallantry and intrigue has given sanction to. In this respect we should be happy to see the conduct of Mr. Garrick universally imitated.

GA'RRISON. *s.* (*garrison*, Frenoh.) 1. Soldiers placed in a fortified town or castle to defend it (*Sidney*). 2. Fortified place stored with soldiers (*Waller*). 3. The state of being placed in a fortification for its defence (*Spen.*).

To Ga'rrison. *v. a.* (from the noun.) To secure by fortresses (*Dryden*).

GARRU'LITY. *s.* (*garrulitas*, Latin.) 1. Loquacity; incontinence of tongue (*Milton*). 2. The quality of talking too much; talkativeness (*Ray*).

GA'RRULOUS. *a.* (*garrulus*, Latin.) Prattling; talkative (*Thomson*).

GARSTANG, a town in Lancashire, seated on the river Wyre, with a market on Thursdays. Lat. 53. 56 N. Lon. 2. 53 W.

GARTER, περισκελις, a ligature to keep up the stockings; it is also particularly used for the badge or cognizance of a noble order of knights, hence denominated the

Order of the Garter, a military order, next in dignity after the nobility, instituted by king Edward III. in 1344, under the title of the sovereign and knights-companions of the most noble order of the garter.

This order consists of twenty-six knights, or companions, generally peers or princes; whereof the king of England is the sovereign, or chief.

They wear a garter, set with pearls and precious stones, on the left leg, between the knee and calf, with this motto; *honi soit qui mal y pense*, q. d. shame to him that thinks evil hereof: and they bear this motto surrounding their arms. The meaning of which motto is said to be, that king Edward having laid claim to the kingdom of France, retorted shame and defiance upon him that should dare to think amiss of the just enterprize he had undertaken for recovering his lawful right to that crown; and that the bravery of those knights whom he had elected into this order was such as would enable him to maintain the quarrel against those who thought ill of it.

They are a college or corporation, having a great and little seal: their officers are, a prelate, chancellor, register, king at arms, and usher.

Besides which, they have a dean, and twelve nons, with petty canons, vergers, and twen-six pensioners, or poor knights.

The prelate is the head; and the office is vested in the bishop of Winchester: next to him is the chancellor, which office is vested in the bishop of Salisbury, who keeps the seals. All these officers, except the prelate, have fees and pensions.

The order is under the patronage or protection of St. George of Cappadocia, the tutelar saint of this kingdom. Their college is held at the castle of Windsor, within the chapel of St. George, and the chapter-house, erected by the founder for that purpose. Their robes, &c. are the garter, decked with gold and gems, and a buckle of gold, to be worn daily; and, at feasts and solemnities, a sur-coat, mantle, high velvet cap, collar of SS's composed of roses enamelled, &c.

The mantle is the chief of those vestments made use of on solemn occasions. Its colour is by the statutes appointed to be blue. The length of the train of the mantle only distinguishes the sovereign from the knights-companions: to the collar of the mantle is fixed a pair of long strings, anciently wove with blue silk only, but now twisted round, and made of Venice gold and silk, of the colour of the robe, with knobs or buttons, and tassels at the end. The left shoulder of the mantle has from the institution been adorned with a large garter, with the device honi soit, &c. within this is the cross of the order, which was ordained to be worn at all times by king Charles I. At length the star was introduced, which is a sort of cross irradiated with beams of silver. The collar is appointed to be composed of pieces of gold in fashioned garters, with the ground enamelled blue, and the motto gold.

When they wear not their robes, they are to have a silver star on the left side; and they commonly bear the picture of St. George, enamelled on gold, and beset with diamonds, at the end of a blue ribbon, crossing the body from the left shoulder. They are not to appear abroad without the garter, on the penalty of 6*s.* 8*d.* paid to the register.

The manner of electing a knight companion into this most noble order, and the ceremonies of investiture, are as follow:—When the sovereign designs to elect a companion of the garter, the chancellor of the order draws up the letters, which, passing both under the sovereign's sign manual and signet of the order, are sent to the person by Garter principal king at arms, and are to this effect: "We, with the companions of our most noble order of the garter, assembled in chapter, holden this present day at our castle at Windsor, considering the virtuous fidelity you have shewn, and the honourable exploits you have done in our service, by vindicating and maintaining our rights, &c. have elected and chosen you one of the companions of our order. Therefore, we require you to make your speedy repair unto us, to receive the ensigns thereof, and be ready for your installation upon the day of this present month," &c. The garter, which is of blue velvet bordered with fine gold wire, having commonly the letters of the motto of the same, is, at the time of election, buckled on the left leg by two of the senior companions, who receive it from the sovereign, to whom it was presented on a velvet cushion by Garter king at arms, with the usual reverence, whilst the chancellor reads the following admonition enjoined by the statutes: "To the honour of God omnipotent, and in memorial of the blessed martyr St. George, tie about thy leg, for thy renown, this noble garter; wear it as the symbol of the most illustrious order, never to be forgotten or laid aside; that thereby thou mayest be admonished to be courageous, and having undertaken a just war in which thou shalt be engaged, thou mayest stand firm, valiantly fight, and successively conquer." The princely garter being thus buckled on, and the words of its signification pronounced, the knight elect is brought before the sovereign, who puts about his neck, kneeling, a sky-coloured ribband, to which is appendant, wrought in gold within the garter, the image of St. George on horseback, with his sword drawn, encountering with the dragon. In the mean time, the chancellor reads the following admonition: "Wear this ribband about thy neck, adorned

with the image of the blessed martyr and soldier of Christ St. George, by whose imitation provoked, thou mayest so overpass both prosperous and adverse adventures, that having stoutly vanquished thine enemies both of body and soul, thou mayest not only receive the praise of this transient combat, but be crowned with the palm of eternal glory." Then the knight elected kisses his sovereign's hand, thanks his majesty for the great honour done him, rises up, and salutes all the companions severally, who return their congratulations.

Since the institution of this order, there have been eight emperors, and twenty-eight kings, besides numerous sovereign princes, enrolled as companions. Its origin is somewhat differently related: the common account is, that it was erected in honour of a garter of the countess of Salisbury, which she dropped dancing with king Edward, and which that prince picked up: but our best antiquaries think it was instituted on account of the victory over the French at Cressy, where the king ordered his garter to be displayed as a signal of the battle.

Garter, *principal King at Arms.* This office was instituted by Henry V. Garter and principal king at arms are two distinct offices united in one person: Garter's employment is to attend the service of the order of the garter; for which he is allowed a mantle and badge, a house in Windsor-castle, and pensions both from the sovereign and knights, and, lastly, fees. He also carries the rod and sceptre at every feast of St. George, when the sovereign is present, and notifies the election of such as are newly chosen; attends the solemnity of their installations, &c.

Garters, in ornithology, coloured rings in some birds, round the naked part of the thighs just above the knees.

To Ga'rter. *v. a.* (from the noun.) To bind with a garter.

GARTH. *s.* The bulk of the body measured by the girdle. In some parts of England this name is given to a little back yard, or close.

Garth-men, is used in our statutes for those who catch fish by means of fish-garths, or wears.

Garth (Sir Samuel), an English poet and physician, was born in Yorkshire, and educated at Cambridge, where he took the degree of M.D. in 1691. He greatly contributed to the carrying into execution the project of establishing dispensaries, in which the college was engaged, and which was opposed by the apothecaries. He lashed the apothecaries for their venal spirit, in his poem of the Dispensary, which had uncommon success. In 1697 he spoke the annual speech in Latin before the college on St. Luke's-day, which gained him the reputation of a distinguished orator. His practice in his profession was now great, and he was universally beloved for his humanity and amiable manners. On the accession of George I. he was knighted, and appointed the king's physician in ordinary, and physician-general to the army. He died in 1718-19.

GARUM, a word in very common use among the old writers on medicine, who expressed by it a pickle, in which fishes had been preserved. The principal kind of fishes they preserved in this manner was the mackarel. The way in which this garum was prepared is unknown to us. The moderns mean no more by this word, than the pickle in which herrings, or anchovies, are preserved.

GARUMNA, a celebrated river, now known by the name of Garonne.

GARZI (Lewis), a painter, the disciple of Andrea Sacchi, and the rival of Carlo Maratti, was born at Pistois in Tuscany. His paintings are greatly admired in Italy. At the age of 80 he painted the dome of the church Stigmatie, in Rome, by order of Clement XI. which is deemed his finest work. He died in 1721, at the age of 83.

GAS, in chemistry. See Gass.

GASCOIGNE (Sir William), lord chief justice of the king's bench, was born at Gawthorp, in Yorkshire, in 1350, and being bred to the law, was in 1398, on the accession of Henry IV. raised to the rank of chief justice of the king's bench. He distinguished himself by his integrity, loyalty, and inflexible justice, and particularly by a memorable transaction in the latter end of that reign. A servant of the prince of Wales, afterwards Henry V. being arraigned for felony, at the king's bench bar, the prince, his master, hasted to the court, and not only ordered sir William to release him, but attempted his rescue. When being opposed by the lord chief justice, who ordered him to leave the prisoner and depart, he rushed with fury up to the bench, and struck that judge, while he was sitting in the execution of his office. Upon which sir William, after some grave expostulations on this outrage and unwarrantable interruption of the course of justice, committed that young prince to the king's bench prison, there to wait his father's pleasure; and the royal youth was so struck with the reproof, that he submitted to that disgraceful punishment with a calmness as sudden and surprising as the offence which occasioned it. The king, on hearing the affair, said, he thanked God for having given him both a judge who knew how to administer, and a son who could obey justice. This action had a happy effect on the prince, who had for some time led a dissolute life; but he now became reformed, and being soon after raised to the throne, by the title of Henry V. was far from shewing the least resentment against sir William, who died on the 17th of December, 1413.

GASCOIN, or Gaskin, of a horse, is that part of the hind quarter extending from the stifle (or inferior point of the thigh approaching the belly) to the bend of the hock behind; upon the shape, strength, and uniformity of which, the property, action, and excellence of the horse very much depends. If the gaskins be wide, and divide below the tail in an extensive arch on the inside, with a bold swell of the muscle on the outside, these not only indi-

cate great strength, but add considerably to the symmetry of the horse, when viewed from behind. A horse well formed in the gaskins, is seldom badly shaped in the fore quarters; nor are such, in general, horses of inferior action; exclusive of which, they are necessarily free from the very awkward defect of cutting: an inconvenience of no small magnitude to a traveller with a weary horse upon a long journey.

GASCONADE, a boast or vaunt of something very improbable. The term has its rise from the people of Gascony in France. See Gascony.

GASCONY, a late province of France, bounded on the W. by the bay of Biscay, on the N. by Guienne, on the E. by Languedoc, and on the S. by the Pyrenees. The character of the inhabitants has been long that of a lively people, famous for boasting of their valour, which has occasioned the name of gasconade to be given to all bragging stories. This province, with Armagnac, now forms the department of Gers.

To GASH. *v. a.* (from *hacher*, French, to cut.) To cut deep so as to make a gaping wound.

Gash. *s.* (from the verb.) 1. A deep and wide wound (*Spenser*). 2. The mark of a wound (*Arbuthnot*).

GASHED LEAF. In botany. Folium incisum dissectum. Having the sections or divisions usually determinate in their number; or at least more so than in the laciniate leaf. The gashed differs from the cleft leaf (*fissum*), in having the sections extending but little beyond the edge (though deeper than in the crenate leaf); while in the cleft leaf they reach almost to the middle. See Dissect and Laciniate.

GA'SKINS. *s.* Wide hose; wide breeches (*Shakspeare*).

GASOLITRO, an instrument contrived by M. Goldschmidt, of Paris, to examine and measure the gasseous contents of mineral waters. This apparatus was designed, not only to expedite the process, but also to get rid of the trouble of using lime-water to detect the carbonic acid gass, and the inaccuracy resulting from its use, and from the variations of pressure in the common mercurial apparatus. In Pl. LXXVIII. A is a glass funnel to pour in the mercury into the glass cylinder C, which is graduated, shut by the cock B, and cemented on the plate D, made of delft-ware; E, wooden stand; F, stand to support the apparatus; G, glass tube, the cavity of which is about $\frac{1}{16}$ of an inch in diameter, and which communicates with the cylinder C; H, tube of the same diameter, communicating also with the cylinder C, and returning by an iron cock into the bottle J, intended to receive the mercury; K, cock for a double current of air; L, a matrass containing about four ounces of water, secured to the cock by a screw; M, sandbath; N, furnace; O, pump, the cylinder of which is glass, secured by two screws to the stand F; the use of this pump is to graduate the cylinder C; P, glass measure, to contain a known quantity; Q, cock for a double current of air; R, bladder to contain the gass; S, cock; T, cock for a double current of air; U, glass pipe, coming from the cock T to K; Z, index of the second current of air. To know the quantity of gass which any gasseous water contains, we thus dispose the apparatus. Having shut the cock H, we fill the cylinder with mercury; we shut the cocks B and K, and open the cock A, to know the state of the apparatus; if it be in proper order, it will not make a vacuum in the cylinder C, further than the first mark; we fill the matrass up to the neck with the water we intend to analyse, and carefully fit the matrass to the cock K, by a screw provided with a little shield of leather: the whole being well secured, we open the cocks K and H, and heat the water to the boiling point. (Med. and Phys. Journal. English Encyclopedia).

To GASP. *v. n.* (from *gape*, *Skinner*.) 1. To open the mouth wide; to catch breath with labour (*Addison*). 2. To emit breath by opening the mouth convulsively (*Dryden*). 3. To long for (*Spectator*).

Gasp. *s.* (from the verb.) 1. The act of opening the mouth to catch breath. 2. The short catch of breath in the last agonies (*Addison*).

GASS. (from the German, *gheist*; or the common Teutonic gart; from which root we obtain the terms *ghost*, *ghostly*, *aghast*.) An elastic aëriform fluid. It is written by the French, *gaz*, but improperly: it is also written by most English writers, *gas*, yet, we think, improperly also, as an English word, since our established orthography duplicates in almost all monosyllables the terminating consonant, as in *ass*, *pass*, *lass*, *glass*, in *all*, *ball*, *call*, in *buff*, *cuff*, *stuff*, and formerly, in *winn*, *supp*, &c.: In *lack*, *sack*, *crack*, &c. the double consonant is in like manner retained, the final *k*, having the power of a *c*: while in the term *gass* itself, every one spells it with a double *s* in the plural, and writes, not *gas-es*, but *gass-es*.

This term was first used in chemistry by Van Helmont, who denoted by it the vapour of charcoal, (gass sylvestre) now known to be carbonic acid gass: he also applied it to other aërial fluids produced in his experiments; as gass tingue, extricated from inflammable substances during their their analysis by heat; gass flammeum, produced by the deflagration of nitre; gass vitiale, the spirit of life, &c. The air of the atmosphere he called gass ventosum. At present, gass is employed as a general term, to express all those aërial fluids, whether produced by chemical experiments or evolved in natural processes, which are not condensible by the cold of our atmosphere, and which differ from the air of the atmosphere: indeed, atmospheric air is a compound of three of the gasses, as will appear on referring to the articles Air and Atmosphere. The term gass does not include those aërial substances which arise from water, ether, and other fluids, on the application of heat, although Lavoisier, and others, speak of aqueous gass, etherial gass, &c.: these are now distinguished by the name of steam, or vapour, because they are easily condensed into their respective fluids again, merely by a certain reduction of temperature; whereas the gasses retain their elasticity in every variation of the temperature and pressure of the atmosphere.

Of these gasses there are now a considerable number known: the principal of them are enumerated at the end of the articles AIR and CHEMISTRY; and will be found particularly described under their specific names.

1. *History of discoveries relating to gasses.*—As these aërial fluids are so curious in themselves, and of so much importance in the economy of nature, and as the knowledge of them has contributed more, perhaps, than any thing else to the advancement of chemical science, we trust we shall be justified, in the opinion of our readers, for pursuing the history of gasses to a greater extent than is usual in the introduction of our articles. In one sense, indeed, there will be an advantage in this measure; for we shall thus be enabled to bring together into one view a number of connected observations which must otherwise have been scattered in different parts of our work, and which, in such a state of dispersion, would have failed to present a distinct and comprehensive idea of the progress of discovery, relating to one of the most interesting branches of natural philosophy. In tracing the outlines of this history, we shall avail ourselves of many observations in an excellent paper in Tilloch's Philosophical Magazine, vol. 9. on the Chemical Knowledge which the Philosophers of the 16th and 17th Centuries had of the different Gasses.

If we pass over the remotest traces which occur here and there in the works of the ancient writers, Van Helmont seems to stand at the head of those more acute philosophers, who distinguished these subtile fluids from the air of the atmosphere. For, though it cannot be denied, that he disfigured his valuable discoveries by numerous fictions, and concealed them under new and commonly barbarous names, which were for the most part improper, yet he first informed physicians and naturalists, and proved clearly by observations and experiments, that other fluids existed, which, though they approach very near to the air in subtilty, transparency, and particularly in elasticity, yet differ from it very much; and, as they differ also from vapours, he distinguished them by the particular name of gass, as above related. He was acquainted with the air of the celebrated Grotto del Cane, near Naples, (see CARBONIC ACID), as well as with the exhalations in mines, against the pernicious effects of which cautions had been given long before his time by Andrew Libavius and George Agricola; and he knew also, that they killed animals which had purposely or accidentally been exposed to them, as well as imprudent persons, and particularly miners. He was in particular acquainted with that gass which some, because it inflames when it comes in contact with a burning body, call inflammable gass, and which others, because they consider it as an essential component part of water, name hydrogen gass; and he knew also that it had been observed before him in mines by Libavius: he convinced himself that even eructations were of the same nature, and that this gass formed a principal component part of smoke: he likewise considered flame to be only inflamed smoke. His knowledge, however, was not confined to this gass alone, for under the name of gass sylvestre he was acquainted with nitrous gass, produced by the action of aqua-fortis when silver is dissolved in it; and he knew also that when it came in contact with the atmosphere it formed fiery red vapours.

He appears to have been acquainted also with the muriatic acid gass, and the sulphuric acid gass.

He had become acquainted also, different ways, with that gass which shows itself in air in which various bodies, and particularly coals, have been burnt; and on that account he had given it the name of coal gass; though he had seen abundance of it in various places, and accompanying other phœnomena, both in living human bodies, as for example in belching, and on a larger scale, as in wine and beer cellars, and during the effervescence of different substances when acids were poured upon them, in the Grotto del Cane and other subterraneous places; particularly in acid waters, from which it rises in bubbles, and they are indebted to it, he says, for all their healing qualities. He remarks also of this gass, that, as it extinguishes the flame of a lamp or taper, it extinguishes also the flame of life. He proved, that the volume as well as the goodness of air is lessened by bodies burning in it; for, having placed a burning taper under a glass in such a manner that it stood three inches above the water in the vessel, he saw the water rise, assume the place of the decreasing air, and at length extinguish the taper.

He had observed also, that an air could be produced from nitre, which he called flame gass, and which was disengaged on coal being added to it; and he thence conjectured the presence of vital air in that salt. He entertained also the opinion, which modern chemistry has supported by so many conclusive proofs, that all these air-like fluids are indebted for their form to the effects of fire, or, as we commonly say at present, to caloric.

It cannot, however, be denied, that Van Helmont considered as different gasses those which differ only by accidental corruption, as the carbonic acid gass, according as it is drawn from this or that body, and in this or that manner; and that he confounded others, or did not make a proper distinction between them. Yet before Priestley, most of the philosophers who paid attention to this subject made no other difference between these kinds of gass, than that some of them inflame when brought into contact with a burning body, while others instantly extinguish a flame.

Van Helmont suspected also the great similarity which, in regard to air, is found between flame and animal life. This was more clearly perceived by Thomas Willis and Francis Sylvius de la Boë, a man whom few have equalled in genius or eloquence.

This Sylvius proved nothing by experiments; but he made it probable, according to his manner, that sourish particles of nitre floated about in the common atmosphere, and approached so near to the prevailing principles of the present day, that he supposed fire (or caloric) was continually diffused through the air.

The celebrated Spanish mineralogist Alphonso Barba was acquainted with those pernicious damps which arise so often in mines, and which, though they resemble air in other respects, have however an offensive smell, extinguish lights, and deprive men, birds, and even snakes, of their life.

Boyle, to whom natural philosophy in general is under so many obligations, though he erred in ascribing the increase of weight which metals acquire by calcination, rather from the fire than to particles from the atmosphere, was nevertheless acquainted with the carbonic acid gass as it rises

from coral, when it effervesces with vinegar, from bread, cherries, grapes, pears, apricots, plums, gooseberries, peas, &c. when they ferment, and its highly pernicious effects on animals; as also with the inflammable, as it partly occurs in abundance in many mines, for example, those of Hungary, partly as it arises by a solution of iron in diluted sulphuric acid or muriatic acid, and its property of inflaming when brought into contact with flame.

The latter as a highly pernicious kind of gass, abundant in coal-pits, is mentioned by Martin Lister, Jessop, and P. R. Moslyn; and a fire which took place in a coal-pit by the inflammation of such vapour is mentioned by Hodgson, in the Philosophical Transactions for 1676.; a like vapour was found about the same time by Beaumont in other subterranean holes; by T. Shirley above a spring, and Wolfstriegel and Vollgnad in a spring. Pope, in the first volume of the Philosophical Transactions, gave a very lively picture of that corrupted kind of gass in a hole near the lake of Agnano; and L. A. Portius and Leonhard à Capua, that of Grotto del Cane, and other caverns in the neighbourhood of Naples; E. Hagendorn and F. Hoffmann, the dangerous quality of air in which coals have been burnt; and T. Birch, in 1668, that of air which has been corrupted by the breath of animals. S. Ledelius mentions the death of a person which took place in a cellar filled with wine in a state of fermentation. This gass, as it rises both from fermenting liquids as well as from lixivious salts and earths, when they effervesce with acids, and in which, even in his time, Bernoulli sought for the cause of this effervescing, was perfectly well known to sir Christopher Wren, in 1675. He relates a method by which such fluids can be collected and preserved in vessels; and he knew that the above gass is absorbed by water, and he distinguishes it very clearly from nitrous gass. Even the nitrous gass of the moderns seems to have been known to Huygens and Papin, for they relate, that they obtained such a fluid from the mixture of spirit of wine and spirit of nitre under the receiver of an air-pump.

At the same period, F. Slare and T. Willis ascribed the dark red colour of the blood to the air; and J. Mayow, another Englishman, with whom another Oxford physician, Henry Mund, and also Willis, L. M. Barbieri, and J. B. Giovanni, concurred, made the whole use of breathing to consist of this—that the lungs of animals inhale from the atmosphere nitrous particles, which are diffused over the animal spirits and communicate warmth to the blood. J. N. Pechlin, also, attributes the faculty of some divers being able to remain longer under water to a greater quantity of nitre. From all this, it appears, that the physicians of that period had a kind of idea of vital air, and its influence on the animal economy.

Stephen Hales, who made further progress by his numerous experiments in discovering the secrets of nature, placed beyond all doubt, by a long series of experiments, the elasticity of these fluids as they are expelled from bodies by heat, fermentation, corruption, and effervescence, a power which was before observed by Newton, and at the same time showed several and ingenious methods how they could be observed, preserved, measured, weighed, and even handled. He remarked the inflammability of those which the inflammable bodies of every kingdom of nature yield by exposure to a strong heat, the properties of others which arise from effervescing mixtures, and which suddenly extinguish flame. He observed likewise, exceedingly well, the great difference of the nitrous gass which he obtained when he poured upon antimony aqua regia, or spirit of nitre; or the latter diluted with water (aqua-fortis) upon iron filings or quicksilver, and its property of forming red clouds with common air as soon as it comes in contact with it; and, by repeated experiments, that it absorbed a great portion of air; and also, that the oftener the experiment was repeated, the gass always absorbed the less air; that several of these gasses were absorbed by water; how much the best air is corrupted by the breathing of even the soundest men, so that at last it is totally unfit for respiration. He knew also the ammoniacal as well as the muriatic acid gass, and the sulphuric acid gass, and had learned, from his own experience, that the latter can be as strongly compressed as common air. He knew also that metals increase in weight by calcination, and again decrease on being revived; for he found that red lead in the preparation had increased in weight about a twentieth part, and by a strong heat gave a great deal of air; his own experience had taught him also that phosphorus, sulphur, and a tallow candle, absorb some of the air in which they burn, as animals absorb some of the air in which they breathe; though he ascribed the pernicious change which the air thereby experiences, not to the loss it sustains, but rather to the corrupt evaporation with which it is filled. He had observed, though less perfectly, that phosphorus after combustion increased in weight by imbibing something from the atmosphere. He had discovered that an aëriform substance was contained in acidulous waters, and that air was continually absorbed by plants in a healthy state. See his Statical Essays, passim.

In this difficult doctrine, however, he left a great deal to be explained by his followers; for he did not define and was not acquainted with the difference of many of the gasses, and some of them escaped his notice altogether. The further illustration of them was reserved for the modern chemists. Thus, in particular, the following authors have very much contributed to enlarge our knowledge of the carbonic acid:—Dr. Black, in 1764; T. Henry, in 1773; the Dutch naturalist, D. De Smedt, in the same year; T. A. Emmer, in 1784. Among the Germans, N. C. Jacquin, in 1769; and J. J. Well, in 1772. Among the Italians, Fontana, in 1774. In Switzerland, Sol. Schintz, in 1778, and in Sweden, sir Tobias Bergman. The last mentioned chemist shewed also, as did Brownrigg in England, and Venel in France, that acid waters are principally indebted to this substance for their properties; so that several chemical authors, such as Bergman, Rouelle, Duchanoy, Laugier, Meyer, and Köstlin, have described the process by which they can be exceedingly well imitated.

With the like care and ingenuity, the following writers have examined the nature of the inflammable kinds of gass: Lassone, in 1766; Volta, in 1777; Senebier, of Geneva, in 1784; Minkelers, of Lovain, in 1784; Kirwan, in 1786; Moscheni, of Lucca, in 1788; Gengembre, and Raymond, in 1791; Nieuwland, Deiman, Froostwyk, and Bondt, in 1792. The three last, together with Lauremburg, examined the different kinds of inflammable gass.

The dephlogisticated nitrous air of Dr. Priestley, now called nitrous gass, has been also examined

by Fontana, Bochaute, Deiman, Bondt, Nieuwland, Footswyk, &c. &c. Azotic gass was noticed by professor Schmidt in the first volume of Gren's Journal; Wieglib in Crell's Annals, in 1796; and a multitude of writers since. The inflammable muriatic acid gass was treated by Westrumb in Crell's Annals for 1790, &c.

But this new field in the province of natural knowledge has been cultivated in a more extensive manner, by a variety of authors, who have not confined their attention to one or two gasses, but have investigated with more or less precision and advantage all that they had an opportunity of examining. In Italy, Barbarigo, Fontana, Bucci, and Volta; in France, Berthollet, Bucquet, Cornius de la Metherie, Rouland, Sigaud de la Fond, Thouvenel, Lavoisier, Fourcroy, &c.; in England, Keir, Plunket, Cavallo, Cavendish, Higgins, &c. &c.; in the Netherlands, Froostwyk and Deiman; in Germany, Achard, Herbert, Leonardi, Weber, &c. But among the philosophers who have explained and illustrated the nature of these gasses by numerous experiments, made with great care and accurately described, none have distinguished themselves more than Scheele and Dr. Priestley. The former a native of Germany, but settled in Sweden, invented very simple processes, yet well calculated to answer the proposed end, of examining these gasses, by which means he discovered new kinds, and proved the existence of those already known in a much clearer method than had been done before in his Abbandlung von der Luft und dem Feuer nebst einem Vorbericht von T. Bergman, Upsal and Leipsic, 1777, 8vo.; and in Kongl. Svensk. Vetenskap. Academ. Handling, 1774, p. 84. The latter, being furnished with a more extensive apparatus, placed in a clearer point of view not only the nature and differences of the gasses before discovered, but discovered new ones also. An account of his experiments may be seen in Experiments and Observations on the different Kinds of Air, London, 8vo. vol. i. 1774, vol. ii. 1775, vol. iii. 1777; Experiments and Observations relating to various Branches of Natural Philosophy, with a Continuation of Observations on Air, 8vo. vol. i. London, 1779, vol. ii. Birmingham, 1782, vol. iii. 1790; Directions for impregnating Water with fixed Air, &c. London, 1772, 8vo.; Philosophical Transactions of the American Society, 1796; and various other works within this period may be consulted with advantage.

In consequence of these researches, the nature of gasses in general became better understood, and their characteristic properties were ascertained with sufficient accuracy to point out and establish a clear distinction between the individual gasses. Hence, therefore, it is unnecessary to pursue our history farther in this place; for, though these interesting fluids have recently engaged, more universally than ever, the attention of philosophers, the discoveries which have been made respecting each will admit of a more convenient arrangement under the name of the particular gass to which they relate.

The gass arising from the distillation of coal has lately been applied, on a large scale, to the illumination of houses, manufactories, streets, &c.

2. *Formation of gasses.*—Every individual gass is supposed to be formed of two elements; the particular substance which gives name to the gass, and is called its basis—and caloric, by the expansive power of which it is made to assume the gasseous form, and of which different proportions are required to combine with different substances. We are not able to set a limit to the number of bodies which may be made to assume this form, or to that of the various processes and combinations during which gasses are involved.

In order to reduce any substance to the state of gass, the application of caloric may be made in different ways. The most simple method consists in placing the body in contact with another body that is heated: in this situation, the caloric on one hand diminishes the affinity of aggregation or composition, by separating the constituent principles to a greater distance from each other; and on the other hand, the caloric unites with the principles to which it has the strongest affinity, and volatilizes them. This process is according to the method of simple affinities; for, in fact, it consists of the exhibition of a third body, which, presented to a compound, combines with one of its principles, and carries it off. The method of double affinity may also be used for the same purpose; as when we cause one body to act upon another to produce a combination, in which a disengagement of some gasseous principle takes place. If, for example, sulphuric acid be poured upon oxyd of manganese, the acid combines with the metal, while its caloric seizes the oxygen, and rises with it. This takes place, not only in the instance we have quoted, but on all other occasions wherein an operation being performed without the application of heat, there is a production of vapour or gass. The various states under which bodies present themselves to our eyes, depend almost entirely upon the different degrees of combination of caloric with these bodies: fluids do not differ from solids, nor gasses from fluids, but because they possess such a quantity of caloric as is requisite to maintain them in one or the other state respectively. For the methods employed in preparing the different kinds of gass, we refer to their names.

3. *Modes of collecting and transferring the gasses.*—It was not long after the discovery of the gasses, and the proof of their diversity, that methods were devised to manage them at pleasure. Dr. Priestley, the most successful, though not the earliest cultivator of this department of chemistry, the extension of which forms a most important era in the history of the science, was the first who effected a contrivance by which these singular fluids may be collected, retained, transferred from one vessel to another, and subjected to every variety of experiment at the will of the operator. The principal article in the pneumatic apparatus is the trough, resorvoir, or cistern, which has been much improved in point of convenience since it was first invented; though the principle of its construction is retained. The present form of this vessel is represented in fig. 1. Pl. 77. It may be made either of wood lined with leather, or of sheet iron, tinned, japanned, or painted: wood alone is not so proper, because if not kept full of water it will become leaky. A little below its brim a shelf AB is placed, about a half or third part as wide as the trough; in this shelf are several holes, each terminating a funnel-like excavation, the widest part of which is on the under side of the shelf. The use of the shelf is to support receivers, jars, bell-glasses, or other vessels intended to contain the gass. To use the trough, so much water must be poured into it as is sufficient to cover the shelf to the depth of about an inch; and the receiver being filled with water

in the deep part, must be placed invertedly on the shelf, its open end turned down upon one of the holes; the gass then being conveyed to the under part of the excavation by means of a curved or other tube, or suffered to escape from its former vessel, will ascend through the hole into the receiver, displacing the water as the quantity of gass increases. This trough may be made of various sizes, according to the purpose for which it is intended: one of about two feet long, 16 inches wide, and 15 high, will be found sufficient for most experiments. Sometimes, however, a much larger one is necessary; and in laboratories, where a considerable number of experiments are performed, it is also requisite to have several smaller ones, which may be moved when necessary near a furnace, or wherever they may be wanted. Fig. 2. represents a jar, being filled with gass, standing in a dish containing water, and having two handles to transport the vessels from one cistern to another, or for keeping them in reserve when the cistern is too full.

A more commodious method of constructing the pneumatic trough is shewn in fig. 3.; where *aa*, is the well to contain the water for filling the vessels, &c.; *bb*, a small shelf with holes; and on a level with it the surface *cc*, covered also with water; and not more than two or three inches distant from the brim; *dd*, depressions, or hollows, to receive the curved necks of bottles, or the curved ends of tubes; *eee*, vessels invented on the surface of the trough; *f*, a large shelf underneath to contain vessels for use. Instead of a rectangular, some persons prefer a curvular, and others an oval shape for their troughs.

Some of the gasses are capable of being absorbed by water, and therefore cannot be collected by means of the above apparatus. When that is the case, mercury must be used; and on account of its gravity and dearness, a smaller trough, formed somewhat differently, must be employed; as represented in figs. 4. and 5., of which the first is a perspective view of the spherical cavity and groove to be filled, and something higher with mercury; the receiving vessel is likewise to be filled with that metal and inverted. Fig. 5. a section of the same, shewing the manner of placing the receiver, and the neck of the retort, or other vessel, from which the gass is to be supplied. The receiver ought to be of smaller diameter, and much stronger than when water is employed. A mercurial trough may be cut out of marble freestone, or a solid block of wood; but the first is preferable. A trough of about twelve inches long, three wide, and four deep, besides the gutter or groove, is sufficient for all private experiments.

In order to acquire expertness in transferring the gasses, it would be advisable for the chemical student to begin his operations with common air, by collecting and transferring which he would soon be qualified to manage any of the other gasses. The bell-glass, or other receiver, being filled with water, and placed with its mouth downwards over one of the holes in the shelf of the trough, let a glass or other vessel be plunged into the water with its mouth downwards; the air within the vessel will prevent the entrance of the water; but if it be turned up, the water rushes in, and the air rises in bubbles to the surface. If this be done under the receiver, the air will descend through the hole, and rising to the upper part of the jar, will there be detained, and expel part of the water it contains. If the air is to be transferred from a vessel that is stopped like a bottle, it must be unstopped with its orifice downwards in the water, and then inclined in such a manner that its neck may come under the excavation of the shelf. The gass will escape from the bottle, and passing through the hole into the vessel intended to receive it, will ascend into the form of bubbles as before. Sometimes a bent glass tube, such as appears connected with the flask in fig. 7, is employed to conduct the gass under the water or mercury into the receiver. Some other methods occasionally resorted to, particularly in collecting gasses for distillations, will be noticed in the article PNEUMATIC APPARATUS.

4. *Dilation or expansion of gasses.*—The influence of caloric, in dilating or expanding bodies, has been long known as a fact; though the laws by which this influence is regulated are not even now perfectly ascertained. In general it is observed that the expansion of bodies is greatest in their gasseous form, less in their fluid, and least in their solid state; as an example, it is known that the expansion of air is more than eight times greater than that of water, and that of water is about 45 times greater than that of iron. Many experiments have been made to ascertain the rate of expansion in gasses according to the elevation of temperature; but the results obtained were so various, on account chiefly of the want of sufficient care to exclude water from the vessels in which the expansion was measured, that for a long time no settled opinion could be formed on the subject. At length, however, the problem engaged the attention of two very ingenious and precise philosophers, whose experiments agree in furnishing a conclusion as curious as it was unexpected; namely, that the progress of dilatation is absolutely equal in all the different kinds of gass; or that all the different elastic fluids, taken at the same temperature, expand equally by heat: that all the different gasses, from the lightest to the heaviest, taken at temperature, are equally expanded by caloric. The experiments of Mr. Dalton were read to the philosophical society at Manchester, in October, 1801, and published in 1802: the dissertation of Gay Lussac did not appear in the Ann. de Chim. (vol. 43), till more than six months after: our own countryman must therefore be regarded as the original discoverer of this important law. Mr. Dalton's experiments are distinguished by a simplicity of apparatus which adds greatly to their value, as it puts it in the power of others to repeat them without difficulty. It consists merely of a glass tube, open at one end, and divided into equal parts; the gass to be examined was introduced into it, after being properly dried, and the tube is filled with mercury at the open end to a given point; heat is then applied, and the dilatation is observed by the quantity of mercury which is pushed out. See Manchester Memoirs, vol. v. Mr. Gay Lussac's apparatus is more complicated, but equally precise; and as his experiments were made on larger bulks of air, their coincidence with those of Mr. Dalton adds considerably to the confidence which may be placed in the results. These experiments are detailed, and the apparatus described in Annal. de Chim. xliii. 187; they may also be seen in Nicholson's Journal, N. S. vol. iii. Still, however, though Gay Lussac found the dilatation to be from 100 to 137·5 between 32° and 212° of Fahrenheit, the precise expansion for increments of single degrees was by no means determined, nor does it appear yet to be attained

with very desirable accuracy. An ingenious and simple method of doing this has been suggested by Mr. Davy. See Nich. Jour. N. S. iv. 32. Comp. with Thomson's Chemistry, i. 341. second edition. See also EXPANSION.

5. *Methods of separating the different gasses from each other.*—As experiments often produce two, three, or more species of gass, it is necessary to be able to separate these from each other, that we may ascertain the quantity and species of each. Suppose that under the jar, standing on the shelf of a pneumatic trough, is contained a quantity of different gasses mixed together, and standing over mercury: we begin with marking with slips of paper the height at which the mercury stands within the glass; and then introduce about a cubical inch of water into the jar, which will swim over the surface of the mercury. If the mixture of gass contains any muriatic or sulphuric acid gass, a rapid and considerable absorption will instantly take place, from the strong tendency these two gasses have, especially the former, to combine with or be absorbed by water. If the water produces only a slight absorption of gass, hardly equal to its own bulk, we conclude that the mixture contains neither muriatic acid, sulphuric acid, nor ammoniacal gass; but that it contains carbonic acid gass, of which water absorbs only about its own bulk. To ascertain this conjecture, introduce some solution of caustic alkali, and the carbonic acid will be gradually absorbed in the course of a few hours: it combines with the alkali, and the remaining gass is left almost perfectly free from any sensible residuum of carbonic acid gas. After each experiment of this kind, we must carefully mark the height at which the mercury stands within the jar, by slips of paper pasted on, and varnished over when dry, that they may not be rubbed off when placed in the water apparatus. It is likewise necessary to register the difference between the surface of the mercury in the jar, and the height of the barometer and thermometer.

When all the gass or gasses absorbable by water are absorbed, water is admitted into the jar to displace the mercury; and the mercury in the cistern is covered with water to the depth of an inch or two. After this, the jar is to be transported by the flat dish before-mentioned, into the water apparatus; and the quantity of gas remaining is to be ascertained by changing it into a graduated jar. Small trials of it are then to be made by experiments in little jars, to ascertain nearly the nature of the gass in question. For instance, into a small jar full of the gass, a lighted taper is introduced; if the taper is not immediately extinguished, we conclude the gass to contain oxygen gass; and in proportion to the brightness of the flame we may judge if it contain less or more of oxygen gass than atmospheric air contains. If, on the contrary, the taper be instantly extinguished, we have strong reason to presume that the residuum is chiefly composed of azotic gass. If, upon the approach of the taper, the gass takes fire and burns quickly at the surface with a white flame, we conclude it to be pure hydrogen gass; if this flame is blue, we judge it consists of carbonated or carburetted hydrogen gass; and if it takes fire with a sudden deflagration, that it is a mixture of oxygen and hydrogen gass. If, again, upon mixing a portion of the residuum with oxygen gass red fumes are produced, we conclude that it contains nitrous gas. These preliminary trials give some general knowledge of the properties of the gass, and the nature of the mixture, but are not sufficient to determine the proportions and quantities of the several gasses of which it is composed. For this purpose all the methods of analysis must be employed; and to direct these properly, it is of great use to have a previous approximation by the above methods. Suppose, for instance, we know that the residuum consists of oxygen and azotic gass mixed together, put a determinate quantity, as 100 parts, into a graduated tube, introduce a solution of sulphuret of potash, and leave it in contact with the gass; in a few days the oxygen will be absorbed, and the azotic gass left pure. A more expeditious method is pointed out in the article EUDIOMETRY.

If hydrogen gass be present, a quantity of the gasseous mixture is introduced into Volta's EUDIOMETER (see that word), along with a known proportion of oxygen gass; these are deflagrated together by means of the electrical spark; fresh portions of oxygen gass are successively added till deflagration ceases, and till the greatest possible diminution is produced. By this process water is formed, and is immediately united to the water of the apparatus; but if the hydrogen gass contain carbon, carbonic acid is formed at the same time, which is not absorbed so quickly; the quantity of this is readily ascertained by assisting its absorption by agitation. If the mixture contain nitrous gass, by the addition of oxygen gass, with which it combines into nitric acid, we can very nearly ascertain its quantity from the diminution produced by this union.

These general remarks are made to convey an idea of this kind of investigation, and to shew the leading principles and rationale of the mode of operation: it is not pretended that they will explain every possible case, which would require a work of large and indefinite extent. A long experience is necessary to become familiar with the analysis of gasses. In many cases, from the difficulty of overcoming the strong affinities by which several of the gasses are combined with each other, and of determining when the separation is complete, we must vary our experiments in every possible point of view; adding new agents to the combination, and keeping out others; and thus continuing our trials, till we are certain of the truth and exactitude of our conclusion.

To the foregoing observations on the means of separating the gasses, for which we are principally indebted to Lavoisier, we must add, that since the publication of that chemist's valuable elementary treatise, various instruments have been contrived for attaining more readily and completely the object of which we are treating, and for receiving and retaining the gasses produced. The earliest of these, which indeed was known to Lavoisier, though he lived not to obtain a perfect set, was the celebrated apparatus of Woulfe, a description of which may be seen under his name. An improved apparatus for preserving separate the gasseous products evolved in many processes was invented by Mr. Pepys, jun. and is represented in Pl. 78. Fig. 1. A, the retort joined to a tubulated receiver B. C. the adapter ground into the neck of the receiver, and furnished with a glass valve made in the same manner as those used in the improved Nooth's apparatus. D. Woulfe's joined to the adapter to receive the unabsorbed gass; and E, a bent tube to carry the gass that may still pass unabsorbed either into a pneumatic apparatus, or into a chimney.

Fig. 2, the valve on a larger scale, and inserted in the neck of the adapter. It consists of an internal tube of small calibre, but pretty stout in substance, and ground into an exterior tube closed at the upper end, but perforated with several small holes to allow the gass to pass. After the internal tube is ground to fit the external, a portion of it is cut out (as at *a*) sufficient to receive a small hemisphere of glass, and to allow the hemisphere to rise a little in its small chamber, but not to turn over in it. The upper piece of the internal tube is then thrust home to the place in which it is to remain, and the glass hemisphere introduced, with its plane incumbent on the upper end of the lower piece of the internal tube, which is ground perfectly flat, as is also the plane of the hemisphere. From the construction, it is obvious that by the upward pressure of any gass, the glass hemisphere may be raised so as to allow the aëriform fluid to pass into the adapter, but that there can be no return of any thing into the receiver, even when a partial vacuum takes place in it; and the greater the excess of the expansive force or pressure exerted at any time in the adapter over that maintained in the retort and receiver, the closer does the valve become.

Fig. 3, two adapters, A and B, ground to fit into each other, and also to fit into C of fig. 1. Any number may be fitted to each other in the same manner. By this apparatus liquids may be highly impregnated with the gasseous products evolved during distillations. The bent tube T, is for the purpose of conveying the superabundant gass to a chimney or to a pneumatic apparatus. Phil. Mag. xi. 256.

6. *Methods of measuring the volumes of gasses.*—For this purpose we ought to be provided with several graduated glasses or jars, of different sizes, and even several of each size, in case of accidents. The manner of graduating them, as recommended by Lavoisier and others, is very easy; care being taken to secure accuracy, which is indispensable. Take a tall narrow glass jar, and having filled it with water, place it upon the shelf of the pneumatic cistern: we ought always to use the same place throughout this operation, that the level of the shelf may always be exactly similar, by which almost the only error to which this process is liable will be avoided. Then take a narrow mouthed phial, holding exactly 5 ounces, 2 drams, 12 grains of water, which quantity corresponds to 10 cubical inches. If you have not one exactly of this capacity, choose one a little larger, and reduce it by dropping in a little melted wax and resin. This phial serves the purpose of a standard for gauging the jars. Make the air contained in this bottle pass into the jar, and mark exactly the place to which the water has descended; add another measure of air, and again mark the place of water, and so on, till all the water be displaced. It is of great consequence, that, during the course of this operation, the bottle and jar be kept at the same temperature with the water in the cistern; and for this reason, we must refrain as much as possible from keeping the hands upon either, or, if we suspect they have been heated, we must cool them again by means of the water. The height of the barometer and thermometer during this experiment is of no consequence. When the marks have been thus ascertained upon the jar for every ten cubical inches, we engrave a scale upon one of its sides, with a diamond pencil. In the same manner, glass tubes are graduated for using in the mercurial apparatus, only they must be divided into cubical inches and tenths. The bottle used for gauging these must hold seven oz. one dr. 15 grains of mercury, which exactly corresponds to a cubical inch of that metal.

Thus prepared, let us suppose that, after an experiment, there is a residuum of gass contained in the upper part of the jar standing on the shelf of a pneumatic apparatus, of which we wish to ascertain the quantity; we must first mark the height to which the mercury or the water rises in the jar, with great exactness, by means of slips of paper pasted round the jar. If we have been operating in mercury, we begin by displacing the mercury from the jar, by introducing water in its stead. This is readily done by filling a bottle quite full of water, stopping it with the finger, turning it up, and introducing its mouth below the edge of the jar, then, turning down its body again, the mercury by its gravity falls into the bottle, and the water, rising in the jar, takes the place occupied by the mercury. When this is accomplished, pour so much water into the cistern as will stand about an inch over the surface of the mercury; then pass the dish B C (Fig. 2. Pl. 77) under the jar, and carry it to the water cistern already described. Here let the gass be transferred into another jar graduated as above described, which will immediately shew its volume. Another method is to turn up the mouth into the marked jar, from which the gass has been liberated, as above, and then to pour in as much water as will reach exactly to the mark made for the gass; by weighing the water carefully, the volume of gas it contained before may easily be determined, allowing at the rate of 1728 cubical inches for each 75·84 pounds troy of water. In experiments where great accuracy is required, the results obtained by these methods will need correction; in the first, with respect to the height of the barometer and thermometer; and in the second, beside the former correction, for the difference between the surface of the water in the cistern, and the height to which it rises in the jar. For the more expeditious and accurate admeasurement of the volumes of gasses, various instruments have been contrived, some of the principal of which are described under the word GASOMETER, which is the general term applied to the apparatus.

7. *To determine the absolute gravity of the different gasses.*—Take a large balloon A, Pl. 79, fig. 4, capable of holding 17 or 18 pints, or about half a cubical foot, having the brass cap *b c d e*, strongly cemented to its neck, and to which the tube and stop-cock *f g*, is fixed by a tight screw. This apparatus is connected by the double screw represented separately at fig. 6, to the jar B C D, fig. 4, which must be some pints larger in dimensions than the balloon. This jar is open at top, and is furnished with a brass cap *b i*, and the stop-cock *l m*. One of these stop-cocks is represented separately at fig. 5. We first determine the exact capacity of the balloon, by filling it with water, and weighing it both full and empty. When emptied of water it is dried with a cloth introduced through its neck *d e*, and the last remains of moisture are removed by exhausting it once or twice in an air-pump. When the weight of any gass is to be ascertained, this apparatus is used as follows: Fix the balloon A to the plate of an air-pump, by means of the screw of the stop-cock *f g*, which is left open; the balloon is to be exhausted as completely as possible, observing carefully the degree of exhaustion by means of the

barometer attached to the air-pump. When the vacuum is formed, the stop-cock fg is shut, and the weight of the balloon determined, with the most scrupulous exactitude. It is then fixed to the jar BCD, which we suppose placed in the shelf of the pneumatic apparatus; the jar is to be filled with the gass we mean to weigh, and then by opening the stop-cocks fg and lm, the gass ascends into the balloon, whilst the water of the cistern rises at the same time into the jar. To avoid very troublesome corrections, it is necessary, during this first part of the operation, to sink the jar in the cistern, till the surfaces of the water within and without the jar exactly correspond. The stop-cocks are again shut, and the balloon, being unscrewed from its connection with the jar, is to be carefully weighed; the difference between this weight and that of the exhausted balloon, is the weight of the gass contained in the balloon. Multiply this weight by 1728, and divide the product by the number of cubical inches contained in the balloon, the quotient is the weight of a cubical foot of the gass submitted to experiment. Exact account must be kept of the height of the barometer, and of the thermometer; and from these the resulting weight of a cubical foot is easily corrected to the standard pressure and temperature; the small portion of air remaining in the balloon after forming the vacuum, and which is readily indicated by the air-pump barometer, must also be taken into the account: thus, if that barometer remain at $\frac{1}{100}$th part of the height it stood at before the vacuum was formed, we conclude that only $\frac{99}{100}$ of the gass was transferred from the jar into the balloon. See Lavoisier's Elements of Chemistry: a work as remarkable for the accuracy of its descriptions, as for the excellence of its philosophy.

Perolle, Priestley, and Chladni, have made some very curious experiments and observations on the tones produced by an organ pipe, and other sonorous bodies, in different kinds of gass. For the influence of gasses in promoting or retarding the growth of seeds, &c. see GERMINATION and PHYSIOLOGY *Vegetable*.

GASS-HOLDER, a vessel for receiving, retaining, and transporting gass. Several contrivances for this purpose have been made by different chemists. Fig. 1. Pl. 79, represents the gass-holder invented by Mr. Pepys, jun. from a suggestion of Mr. Watt's: it may contain from two to ten gallons. G refers to that part of the vessel which is to contain the gass. R the register tube; the ends of which are cemented into two tin sockets by cocks at the top and the bottom of the gass-holder, into which it opens at both ends: of course the level of the water in the apparatus will always be seen in the tube, and consequently that of the gass. C, the circular cistern, with its two cocks and pipes, marked 1 and 2. C k, a brass cock on the side, with a screw, to which bladders or a blowpipe may be attached. O, an opening into the gass-holder, in which a pipe is soldered, at such an angle, that, when all the uppermost cocks are shut, no water can possibly escape. But, when a conducting-pipe, from a retort or other apparatus generating gass, is introduced into this opening, then, as the gass passes up into the gass-holder, an equal quantity of water will be discharged at O, into any vessel fit to receive it. S p, a spout on the side of the cistern to enable the operator to add water, even when the receiver fills its whole area. H H, handles to lift the gass-holder by. R s, a glass deflagrating receiver standing in the cistern. A, its adopting cork and cock. To make use of this apparatus, first fill the gass-holder with water, by closing the opening O with a cork, and also the cock C k, and keeping the circular cistern full of water, while the cocks 1 and 2 are both open. The air is driven out of the gass-holder through the cock 1, by the water descending into it by the cock 2. When full, the water in the register will be on a level with the top of the gass-holder. Then shut the cocks 1 and 2. You may now remove the cork from the opening O, which is then prepared to receive the conducting-pipe from any apparatus from which the gass is generating. As the gas is delivered the water escapes, and should be caught in any convenient vessel. The register will then show the quantity received: when full, close the opening O with a cork wrapped in leather, which prevents the communication with the atmosphere. It may now be easily removed or conveyed where it is wanted.

When it is required to fill a glass receiver, as c, with the gass, having previously filled the circular cistern with water, place it in the cistern, put in the adopting cork A, and with the mouth applied to the cock, exhaust the receiver, in which the water will rise till full. Then close the cock A, and open the two cocks 1, and 2, and the gass will ascend into the receiver, while the water will take its place in the gass-holder. Bladders mounted with cocks may be filled with gass, by first emptying them of air, then screwing them to the cock C k, filling the cistern with water, and opening the cock 2. In all these cases the quantity used may be ascertained, which has a scale of pints or cubic inches, attached to it, and thus far answers the purpose of a gassometer. Mr. P's apparatus is also adapted for combustion, deflagration, and other experiments with the gasses, as well as for the use of the blow-pipe. In these cases, the following additions to the original instrument are highly useful. S, a watch-spring in a slit wire, prepared for combustion. D, a deflagrating dish of iron, for sulphur, phosphorus, sugar, &c. &c. B, a blow-pipe, with a gum-elastic tube E, capable of joining the cock C k.

For simply retaining and conveying the gasses, when it is not necessary to ascertain their quantity, Dr. Warwick, of Rotheram, contrived an apparatus which is much cheaper than the preceding one, and is shewn in fig. 2, Pl. 79. A stop-cock, soldered to the shorter tube in the top of the vessel, and a rim sufficiently deep to permit the water to rise an inch above the cock, will enable any one to transfer any gass with the utmost readiness to any other vessel. The stop-cock has no screw, the blow-pipe having a socket to fit the tube with sufficient accuracy to prevent the escape of air. Phil. Mag. xiii. 256.

Mr. Cavallo's is represented at fig. 3, Pl. 79 where A is a section of the vessel, made of glass or tin; B, a funnel, into which is fastened a bent glass tube, C; D, is a tube soldered to the funnel, and which with it passes through the cork a; E, represents a tube of tin, wood, or other materials, to one end of which a bladder or oiled silk bag is fastened; the other is inserted in the tube D. The vessel A being filled with the required gass (by taking out the funnel, &c. filling the vessel with water, inverting it, and applying the tube leading from the apparatus where the gass is produced), whenever it may be necessary to transfer any quantity to a bottle, bladder, &c. an equal quantity of water is to be poured through the funnel B, which

will displace the gass, and force it through D, into E. The bent part of the tube C, by always containing some water, prevents the gass from escaping through the funnel; but when the apparatus is to be set by, both the funnel and the tube D must be stopped with corks.

GASSES, their effects on sounds. Dr. Chladni, the ingenious inventor of the Euphon, engaged professor Jacquin of Vienna to make some experiments on those gasses which constitute our atmosphere, and serve to produce vocal sounds. Comparative experiments were made with atmospheric gass, oxygen, hydrogen, carbonic acid, and nitrous gass. The intensity of the sounds did not vary; but when compared with that produced by atmospheric air, the oxygen gass gave a sound half a tone lower; azotic gass, prepared by different methods, constantly gave a sound half a tone lower; hydrogen gass gave nine or eleven tones higher; carbonic acid gass one third lower; and nitrous gass very nearly a third lower. A mixture of oxygen gass and azote, in the proportions of the atmospheric air, afforded the same tone as atmospheric air; that is, it was half a tone higher than either of the component parts alone. When the two gasses were not uniformly mixed, the sound was abominably harsh. Maunoir, and Paul of Geneva, after having inspired a large quantity of pure hydrogen gass attempted to speak, but found that the sound of their voices had become shockingly hoarse and shrill. Nicholson's Journal, vol. iii.

GASSENDI (Peter), an eminent French philosopher, was born in 1592 at Charstersier, a village in Provence. Before he was 16, he was made professor of rhetoric at Digne, and soon after professor of philosophy at Aix. The celebrated Nicholas Pieresc having seen his Paradoxical Exercitations, resolved to afford him leisure to pursue his studies, and in conjunction with Joseph Walter, prior of Valette, got him ordained, and procured him a benefice in the church of Digne, which he held twenty years, during which time many of his works were written. In 1645 he was appointed royal professor of mathematics at Paris. He now dedicated himself so intensely to study and astronomical observations, that his health visibly decayed. He was at first relieved by bleeding, but afterwards, when he found himself exceedingly reduced by the repetition for the ninth time of that operation, he modestly remonstrated against it. Two of three physicians that attended him yielded to his opinions but the third arrogantly insisting on the contrary opinion, Gassendi submitted, and he was bled four times afterwards. He died in 1655, in the 63d year of his age. A short time before his death he took the hand of Antony Poller, his amanuensis, and placing it on his heart, Poller observed that its motion was very faint and fluttering; Gassendi replied, "You see what is man's life;" and these were the last words he uttered. He left his manuscripts to M. de Monmor, his friend and executor.

Gassendi wrote against the metaphysical meditations of Des Cartes; and divided with that great man the philosophers of his time, almost all of whom were either Cartesians or Gassendists. To his knowledge in philosophy and mathematics, he joined profound erudition and deep skill in the languages. He wrote, 1. Three volumes on Epicurus's philosophy; and six others, which contain his own philosophy.—2. Astronomical Works.—3. The lives of Nicholas de Pieresc, Epicurus, Copernicus, Tycho Brahe, Purbach, and Regiomontanus.—4. Epistles, and other treatises. All his works were collected together, and printed at Lyons in 1658, in 6 volumes folio.

To GAST. *v. a.* (from gast, Saxon.) To make aghast; to fright; to shock; to terrify; to fear; to affray (*Shakspeare*).

GASTEROSTEUS. Stickle-back. In zoology, a genus of the class pisces, order thoracia. Head oblong, smooth; jaws armed with minute teeth; tongue short, obtuse; palate smooth: eyes moderate, hardly prominent, lateral; gill membrane with three, six, or seven rays; gill-cover of two pieces, rounded, striate; body carinate on each side, and covered with bony plates; dorsal fin single, with distinct spines between it and the head; lateral line straight; ventral fins behind the pectoral, but above the sternum. Thirteen species, scattered through the seas of Europe, Asia, and Africa. The following are the chief:

1. G. aculeatus. Three-spined stickleback. Dorsal spines three. Inhabits the fresh waters of Europe, is very short-lived, hardly ever reaching to the third year: about three inches long: spawns in April and June; is infested with internal worms; feeds on the fry and spawn of fishes, worms, and insects; appears sometimes in vast shoals, and is chiefly used for manure, or to fatten ducks and pigs.

2. G. ductor. Pilot-fish. Dorsal spines four; gill membrane, seven-rayed. Inhabits the ocean; is a constant attendant on the shark, and always precedes it.

3. G. saltatrix. Skip-jack. Dorsal spines eight, connected by a membrane; gill membrane with seven rays. Inhabits Carolina: is less spinous than others of its tribe, and resembles a perch.

4. G. spinachia. Fifteen-spined stickleback. Dorsal spines fifteen. Inhabits the seas of Europe, and is never found in rivers: from six to seven inches long; body long, above brown or olive, beneath silvery: is said to follow a light; feeds on worms, insects, and the young fry and spawn of fishes; is seldom eaten, but used chiefly for manure or lamp-oil. See Nat. Hist. Pl. CXIX.

GASTRELL (Francis), bishop of Chester, was born in 1662, appointed preacher to the society of Lincoln's Inn in 1694, and made bishop of Chester in 1714. He preached a course of sermons for Boyle's lectures; engaged in the Trinitarian controversy with Mr. Collins and Dr. Clarke; and published two excellent pieces, the one entitled Christian Institutes, and the other, a Moral Proof of a Future State. He vindicated the rights of the university of Oxford against the archbishop of

Canterbury, in the appointment of the warden of Manchester college; and opposed the violent proceedings against bishop Atterbury in the house of lords, though he disliked the bishop as a man of arbitrary principles. He died in 1725.

GA'STRIC. *a* (from γαστηρ.) Belonging to the belly or stomach.

GASTRIC ARTERY. Arteria gastrica. The right, or greater gastric artery, is a branch of the hepatic; the left, or lesser, a branch of the splenic.

GASTRIC JUICE. Succus gastricus. In medicine, a fluid separated by the capillary exhaling arteries of the stomach, which open upon its internal tunic. The œsophagus also affords a small quantity, especially in the inferior part. Modern philosophers have paid great attention to this fluid, and from their several experiments it is known to possess the following properties. It is the principal agent of digestion, and changes the aliments into a kind of uniform soft paste: it acts on the stomach after the death of the animal. Its effects show that it is a solvent, but of that peculiar nature that it dissolves animal and vegetable substances uniformly, and without exhibiting a stronger affinity for the one than for the other. It is far from being of the nature of a ferment, as many suppose, for it is one of the most powerful antiseptics with which we are acquainted; and, from the experiments of Spallanzani, Scopoli, Carminati, and others, its nature appears to be essentially different in the several classes of animals, as they have proved by analysis. It has hence been differently classified by different chemists: Moreau regarding it as an acid, some other French physiologists as an alkali, and Spalanzani as a neutral. Upon the whole we may take it for granted, that in the carnivorous, granivorous, and graminivorous tribes (or at least those which possess but one stomach) it is acid; in man, and all other omnivorous animals, it is neutral, the neutrality probably proceeding from the mixture of animal and vegetable foods in the stomach. The gastric juice of the human subject, when healthy, is inodorous, of a saltish taste, and limpid, like water, unless it be a little tinged with the yellow colour of some bile that has regurgitated into the stomach. In quantity it is very considerable, as must be evident from the extent of the surface of the stomach, and its continual secretion; but it is the most copious when solicited by the stimulus of food. Besides the properties of this fluid before mentioned, it has others which have induced physicians and surgeons to exhibit it medicinally. It cures dyspepsia and intermittent fever. Applied externally, in form of fomentation or poultice, it cures putrid and scrofulous ulcers in a wonderful manner; and it is to be regretted that its utility is not more generally known.

Its antiseptic powers are strongly shown in those animals (the vulture and the weasel, for example) that devour their food in the most disgusting state of putrefaction; the food being found to have lost most of its putresepcy after having remained a short time in their stomach.

This liquid is also remarkable on account of its power of coagulating all coagulable fluids: a power, however, which it seems to derive immediately from the stomach itself, since we find this viscus, when taken out of the calf, or almost any other animal, capable of producing the very same result when digested in salted water. It is the stomach of the calf thus digested that forms the well-known substance denominated rennet, and which is so familiarly employed in separating the curd from milk in cheese-making.

GASTRITIS. (*gastritis*, γαστριτις; from γαστηρ, the stomach.) Inflammation of the stomach. A genus of disease in the class pyrexiæ and order phlegmasiæ of Cullen. It is known by pyrexy, anxiety, heat, and pain in the epigastrium, increased when any thing is taken into the stomach, vomiting, hiccup, pulse small and hard, and prostration of strength. There are two species: 1. Gastritis phlegmonoidea, with an inflammatory tumour. 2. Gastritis erysipelatosa, when the inflammation is of a creeping or erysipelatous nature.

GASTROBRANCHUS. Hag-fish. Glutinous hag. In zoology, a genus of the class pisces, order chondropterigia. Mouth terminal, furnished with cirri; teeth in a double pectinate row on each side; upper tooth single, sharp in the roof of the mouth; body eel-shaped, carinate, beneath by a soft fin; spirals two ventral. One species; G. cæcus, so denominated from its being totally destitute of eyes. It inhabits the ocean; is about eight inches long, and is said to enter the mouth of fishes when taken by the hook, and to devour the whole except the skin and bone. When placed in a vessel of sea-water it soon renders the whole gelatinous, being of an uncommonly glutinous nature. This animal has been judiciously removed by later naturalists from the class of worms, where, from the circumstance we have just mentioned, it was placed by Linnéus in the order intestine, under the name of myxine glutinosa. Some naturalists have made two, or two species of this genus, but incorrectly.

GASTROCELE. (*gastrocele*, γαστροκηλη; from γαστηρ, the stomach, and κηλη, a tumour.) A hernia of the stomach, occasioned by a protrusion of that viscus through the abdominal parietes.

GASTROCNEMIUS. (*gastrocnemius*, γαστροκνημιος; from γαστηρ, the stomach, and κνημη, the leg.) The muscles of the foot which from the calf or belly of the leg.

GASTROCNEMIUS EXTERNUS. Gemellus. This muscle, which is situated immediately under the integuments at the back part of the leg, is sometimes called gemellus: this latter name is adopted by Albinus. Winslow describes it as two muscles, which he calls gastrocnemii; and Douglas considers this and the following as a quadriceps, or muscle with four heads, to which he gives the name of extensor tarsi suralis. The gastrocnemiusexternus arises by two distinct heads. The first, which is the

thickest and longest of the two, springs by a strong thick tendon from the upper and back part of the inner condyle of the os femoris, adhering strongly to the capsular ligament of the joint, between which and the tendon is a considerable bursa mucosa. The second head arises by a thinner and shorter tendon from the back part of the outer condyle of the os femoris. A little below the joint their fleshy bellies unite in a middle tendon, and below the middle of the tibia they cease to be fleshy, and terminate in a broad tendon, which, a little above the lower extremity of the tibia, unites with that of the gastrocnemius internus, to form one great round tendon, sometimes called chorda magna, but more commonly tendo Achillis.

Gastrocnemius internus. This, which is situated immediately under the last described muscle, is sometimes named soleus, on account of its shape, which resembles that of the sole-fish. It arises by two heads. The first springs by tendinous and fleshy fibres from the posterior part of the head of the fibula, and for some way below it. The second arises from an oblique ridge at the upper and posterior part of the tibia, which affords origin to the inferior edge of the popliteus, continuing to receive fleshy fibres from the inner edge of the tibia for some way down. This muscle, which is narrow at its origin, spreads wider as it descends, as far as its middle; after which it becomes narrower again, and begins to grow tendinous, but its fleshy fibres do not entirely disappear till it has almost reached the extremity of the tibia, a little above which it unites with the last described muscle, to form the tendo Achillis. This thick round chord is inserted into the lower and posterior part of the os calcis, after sliding over a cartilaginous surface on that bone, to which it is connected by a tendinous sheath that is furnished with a large bursa mucosa.

Both the gastrocnemii have the same use, viz. that of extending the foot, by drawing it backwards and downwards.

GASTRODYNIA. (*gastrodynia*, γαστροδυνια, from γαστηρ, the stomach, and οδυνη, pain.) Pain in the stomach.

GASTRO-EPIPLOIC ARTERY. Arteria gastrico-epiploica. The branch of the greater gastric artery that runs in the epiploon.

GASTRORAPHY. (*gastroraphia*, γαστροραφια; from γαστηρ, the stomach, and ραφη, a suture.) The sewing of wounds of the abdomen.

GASTROTOMY. *s.* (γαστηρ, and τεμνω.) The act of cutting open the belly.

GAT. The preterit of *get*.

GATAKER (Thomas), a learned critic and divine, was born at London in 1574, and studied at St. John's college, Cambridge. He was afterwards chosen preacher at Lincoln's Inn; which he quitted in 1611 for the rectory of Rotherhithe, in Surry. In 1620 he made a tour through the Low Countries, and in 1624 published at London a book, entitled, Transubstantiation declared by the Confession of the Popish Writers to have no necessary Foundation in God's Word. He wrote likewise a defence of this discourse. In 1642 he was appointed one of the assembly of divines, and was engaged with them in writing annotations upon the Bible. He died in July, 1654, in the 80th year of his age. Besides the above works, he published, 1. A Dissertation upon the Style of the New Testament. 2. De nomine tetragrammata. 3. De diphthongis, sive bivocalibus. 4. An Edition and Translation of the Emperor Marcus Antoninus's Meditations. 5. A Collection of Sermons, in folio; and many other works.

GATE, in architecture, a large door, leading or giving entrance into a city, town, castle, palace, or other considerable building. Thebes in Egypt was anciently known by the appellation with a hundred gates. In ancient Rome there was a triumphal gate, porta triumphalis. In modern Rome there is the jubilee gate, which is only opened in the year of a grand jubilee. The gates which were once very numerous in London, after having been converted into gaols or prisons, as Ludgate, Newgate, &c. were at length removed. The lesser or by-gates for foot passengers are called posterns. Gates through which coaches, &c. are to pass should not be less than seven feet broad, nor more than twelve; the height to be 1 the breadth.

Gate, (ȝeat, Sax.), signifies also, a frame of timber upon hinges to give a passage into enclosed fields.

Gate, denotes farther, an avenue or opening.

Gate-net, a net employed by poachers for ensnaring hares in the night. It is at this time applied where hares are suspected to be at feed, to the third bar of the gate through which they are supposed to have entered into the green-wheat, or young clover field in which they are banqueting, or from observation in the day are believed to be so. Being fastened to the ground under the lower bar by means of wooden forked pegs, a lurcher is turned over the gate, who having been trained to the business, and running mute, scours the field in a circuitous direction; when the victims, thus suddenly and unexpectedly alarmed, make immediately for the gate, and the dog being close at their heels, or at least not far behind them, they have no alternative but to rush into the net and become entangled. In this way three or four brace are taken in a plentiful country at one adventure.

Gates of hell, a phrase used in Scripture to denote figuratively, either the grave or the powers of darkness. The Mahometans use the expression literally, and suppose that hell has seven gates.

GATESHEAD, in the county of Durham, is as it were the suburbs of Newcastle, though it lies in another county, being divided by the river Tyne; over which there is a fine stone bridge, with an iron gate in the middle, having the arms of Durham on one side, and those of Newcastle on the other, which is the boundary between the bishopric and Northumber-

land. The church is a fine building, with a very high tower.

GATEVEIN. See VENA PORTA.

GA'TEWAY. *s.* (from *gate* and *way.*) A way through gates of enclosed grounds.

GATH, a celebrated city of the Philistines, famous for having given birth to Goliath. It stood about 14 miles south of Joppa, and 32 west of Jerusalem.

To GA'THER. *v. a.* (ᵹaᵹenan, Saxon.) 1. To collect; to bring into one place (*Genesis*). 2. To pick up; to glean (*Wotton*). 3. To crop; to pluck (*Dryden*). 4. To assemble (*Bacon*). 5. To heap up; to accumulate (*Proverbs*). 6. To select and take (*Psalms*). 7. To sweep together (*Matthew*). 8. To collect charitable contributions. 9. To bring into one body or interest (*Isaiah*). 10. To draw together from a state of diffusion; to compress; to contract (*Pope*). 11. To gain (*Dryden*). 12. To pucker needlework. 13. To collect logically (*Hooker*). 14. *To* GATHER *Breath.* To have respite from any calamity (*Spenser*).

To GA'THER. *v. n.* 1. To be condensed; to thicken (*Dryden*). 2. To grow larger by the accretion of similar matter (*Bacon*). 3. To assemble (*Ecclus*). 4. To generate pus or matter (*Decay of Piety*).

GA'THER. *s.* (from the verb.) Pucker; cloth drawn together in wrinkles (*Hudibras*).

GA'THERER. *s.* (from *gather.*) 1. One that gathers; a collector (*Wotton*). 2. One that gets in a crop of any kind (*May*).

GA'THERING. *s.* (from *gather.*) Collection of charitable contributions (*Corinthians*).

GATTON, a borough in Surrey, which sends two members to parliament, but has neither market nor fair. Lat. 51. 18 N. Lon. 0. 10 W.

GAUDE. *s.* (from *gaudium*, Latin, joy.) An ornament; a fine thing; any thing worn as a sign of joy (*Shakspeare*).

To GAUDE. *v. n.* (*gaudeo*, Latin.) To exalt; to rejoice in any thing (*Shakspeare*).

GA'UDERY. *s.* (from *gaude.*) Finery; ostentatious luxury of dress (*South*).

GA'UDILY. *ad.* (from *gaudy.*) Showily.

GA'UDINESS. *s.* (from *gaudy.*) Showiness; tinsel appearance.

GA'UDY. *a.* (from *gaude.*) Showy; splendid; pompous; ostentatiously fine (*Milton*).

GA'UDY. *s.* (*gaudium*, Latin.) A feast; a festival; a day of plenty (*Cheyne*).

GAVE. The preterit of *give*.

GA'VEL. *s.* A provincial word for ground.

GAVELKIND, a tenure or custom belonging to lands in the county of Kent, and a few places elsewhere. The distinguishing properties of this tenure are various; the principal are these. The tenant is of age sufficient to alienate his estate by feoffment at the age of 15. 2. The estate does not escheat in case of an attainder and execution for felony, their maxim being, "the father to the bough, the son to the plough." 3. In most places he had a power of devising lands by will, before the statute for that purpose was made. 4. The lands descend, not to the eldest, youngest, or any one son only, but to all the sons together; which was indeed anciently the most usual course of descent all over England, though in particular places particular customs prevailed.

GAVELMED, the duty or work of mowing grass, or cutting of meadow land, required by the lord from his customary tenants.

To GAUGE. *v. a.* (*gauge*, a measuring rod, French.) 1. To measure with regard to the contents of a vessel. 2. To measure with regard to any proportion (*Pope*).

GAUGE. *s.* (from the verb.) A measure; a standard (*Moxon*).

GAUGE-POINT, of a solid measure, the diameter of a circle, whose area is equal to the solid content of the same measure. Thus the solidity of a wine-gallon being 231 cubic inches, if you conceive a circle to contain so many inches, the diameter of it will be 17·15; and that will be the gauge-point of wine-measure. And of an ale-gallon, containing 282 cubic inches, by the same rule, the gauge-point for ale-measure will be found to be 19·15. After the same manner may the gauge-point of any foreign measure be obtained; and hence may be drawn this consequence, that when the diameter of a cylinder in inches is equal to the gauge-point of any measure, given likewise in inches, every inch in length thereof will contain an integer of the same measure, e. gr. in a cylinder whose diameter is 17·15 inches, every inch in height contains one entire gallon in wine-measure; and in another, whose diameter is 18·95 inches, every inch in length contains one ale-gallon.

GAUGER, a king's officer, who is appointed to examine all tuns, pipes, hogsheads, and barrels of wine, beer, ale, oil, honey, &c. and give them a mark of allowance, before they are sold in any place within the extent of his office.

There are divers statutes that mention this officer and his office; as by 27 Ed. III. c. 8. all wines, &c. imported are to be gauged by the king's gaugers, or their deputies, otherwise they shall be forfeited, or their value; and on default of the gauger, that he be not ready to do his office when required, or that he defrauds in doing his office to the damage of the buyer or seller, he shall pay the party grieved his treble damage, lose his office, be punished by imprisonment, and be ransomed at the king's will; and in case less is found in the tun or pipe than ought to be, the value of as much as shall lack shall be deducted in the payment.

Every gauger shall truly, within the limits of his office, gauge all tuns, butts, pipes, tierces, puncheons, tertians, hogsheads, barrels, and runlets; and mark on the head of every vessel the contents, upon pain of forfeiting to the party to whose use the wine, &c. shall be sold, four times the value of that which the vessel marked shall lack of its content: the same forfeiture shall be recovered by an original writ, &c. and every person selling the wine, &c. in the vessel marked, shall allow of the price, the value of gauge, or default of filling, upon pain

of forfeiture to the buyer of double the value, to be recovered with costs as before. No brewer shall put to sale any beer or ale in vessels brought from beyond the sea, within the city of London, or suburbs of the same, or within two miles compass without the suburbs, before the same is gauged, and the true content of every such vessel set upon the same, by the gallon appointed for beer and ale, according to the standard, by the master and wardens of the coopers of London.

GAUGING, the art or act of measuring the capacities or contents of all kinds of vessels, and determining the quantities of fluids or other matters contained therein.

As to the solid contents of all prismatical vessels, such as cubes, parallelopipedons, cylinders, &c. they are found by multiplying the area of the base by their altitude. And the contents of all pyramidal bodies, and cones, are equal to 1-3d of the same.

In gauging, it has been usual to divide casks into four varieties or forms, denominated as follows, from the supposed resemblance they bear to the frustums of solids of the same names: viz.

1. The middle frustum of a spheroid.
2. The middle frustum of a parabolic spindle.
3. The two equal frustums of a paraboloid.
4. The two equal frustums of a cone.

And particular rules adapted to each of these forms may be found in most books of Gauging, and in Dr. Hutton's Mensuration, p. 575, &c. But, as the form is imaginary and merely guessed at, it scarcely ever happens that a true solution is obtained in this way; besides which it is very troublesome and inconvenient to have so many rules to put in practice. We shall therefore give here one rule only, from p. 592 of that book, which is not only general for all casks that are commonly met with, but quite easy, and very accurate, as having been often verified and proved by filling the casks with a true gallon measure.

General Rule. Add into one sum,
39 times the square of the bung diameter,
25 times the square of the head diameter, and
26 times the product of those diameters;
multiply the sum by the length of the cask, and the product by the number ·000334; then this last product divided by 9 will give the wine gallons, and divided by 11 will give the ale gallons.

Or, $\overline{39B^2 + 25H^2 + 26BH} \times \frac{L}{114}$ is the content in inches; which being divided by 231 for wine gallons, or by 282 for ale gallons, will be the content.

For Ex. If the length of a cask be 40 inches, the bung diameter 32, and the head diameter 24.

Here	-	$32^2 \times 39$	= 39936
and	-	$24^2 \times 25$	= 14400
and	-	$32 \times 24 \times 26$	= 19968
	the sum		74304
	multiplied by		40
	and divid. by		114)2972160
	gives	- -	26071 cub. inc.

this divided by 231 gives 112 wine gallons, or divided by 282 gives 92 ale gallons.

But the common practice of gauging is performed mechanically, by means of the gauging or diagonal rod, or the gauging sliding rule, the description and use of which here follow.

Gauging, or Diagonal, Rod, is a rod or rule adapted for determining the contents of casks, by measuring the diagonal only, viz. the diagonal from the bung to the extremity of the opposite stave next the head. It is a square rule, having four sides or faces, being usually four feet long, and folding together by means of joints.

Upon one face of the rule is a scale of inches, for taking the measure of the diagonal; to these are adapted the areas, in ale gallons, of circles to the corresponding diameters, like the lines on the under sides of the three slides in the sliding rule, described below. And upon the opposite face are two scales, of ale and wine gallons, expressing the contents of casks having the corresponding diagonals; and these are the lines which chiefly constitute the difference between this instrument and the sliding rule; for all the other lines upon it are the same with those in that instrument, and are to be used in the same manner.

To use the Diagonal Rod. Unfold the rod straight out, and put it in at the bung-hole of the cask to be gauged, till its end arrive at the intersection of the head and opposite stave, or to the farthest possible distance from the bung-hole, and note the inches and parts cut by the middle of the bung; then draw out the rod, and look for the same inches and parts on the opposite face of it, and annexed to them are found the contents of the cask, both in ale and wine gallons.

For Ex. Let it be required to find, by this rod, the content of a cask whose diagonal measures 34·4 inches; which answers to the cask in the foregoing example, whose head and bung diameters are 32 and 24, and length 40 inches: for if to the square of 20, half the length, be added the square of 28, half the sum of the diameters, the square root of the sum will be 34·4 nearly.

Now, to this diagonal 34·4 corresponds, upon the rule, the content 91 ale gallons, or 111 wine gallons; which are but one less than the content brought out by the former general rule above given.

To gauge malt.—1. If the malt lies on the floor in a rectangular form, multiply the length by the breadth, and the product by the depth, all taken in inches; the product is the number of cubic inches in the quantity; which being divided by 2150.42, the quotient is the number of bushels.

The same rule serves for finding the quantity of malt contained in any vessel in form of a parallelopipedon.

Examp. Suppose a quantity of malt on the floor, 288 inches long, 144 inches broad, and $9\frac{1}{2}$ inches deep; required the number of bushels?

Ans. 183.21.

2. When malt is in a cistern, or any vessel, the content of the vessel is to be found in cubic inches, by some of the former rules, and then divided by 2150.42, the quotient is the number of bushels.

3. To find the solidity of any irregular solid.

Put the irregular body into any vessel, and fill it with water; take out the body, and the water will fall lower, and leave a part of the vessel empty, equal to the solidity of the body to be measured; then measure so much water by a vessel of a known capacity as shall fill up the empty space, and the number of cubic inches in that space, and consequently in the irregular body, will be known.

Gauging Rule, or *Sliding Rule*, is a sliding rule particularly adapted to the purposes of gauging. It is a square rule, of four faces or sides, three of which are furnished with sliding pieces running in grooves. The lines upon them are mostly logarithmic ones, or distances which are proportional to the logarithms of the numbers placed at the ends of them; which kind of lines was placed upon rulers, by Mr. Edmund Gunter, for expeditiously performing arithmetical operations, using a pair of compasses for taking off and applying the several logarithmic distances: but instead of the compasses, sliding pieces were added, by Mr. Thomas Everard, as more certain and convenient in practice, from whom this sliding rule is often called Everard's Rule. For the more particular description and uses of this rule, see Hutton's Mensuration, p. 564, 2d edition.

The writers on gauging are, Beyer, Kepler, Dechales, Hunt, Everard, Dougherty, Shettleworth, Shirtcliffe, Leadbetter, Moss, Symons, &c.

GAUL, the name given by the Romans to the country that now forms the kingdom of France. The original inhabitants were descended from the Celtes or Gomerians, by whom the greatest part of Europe was peopled; the name of Galli or Gauls being probably given them long after their settlement in that country. See Gallia.

The Gauls were anciently divided into a great number of different nations, which were continually at war with one another, and at variance among themselves. Cæsar tells us, that not only all their cities, cantons, and districts, but even almost all families were divided and torn by factions, and thus undoubtedly facilitated the conquest of the whole. The general character of all these people was an excessive ferocity and love of liberty. They carried this to such an extreme, that either on the appearance of servitude, or incapacity of action through old age, wounds, or chronic diseases, they put an end to their own lives, or prevailed upon their friends to kill them. In cities, when they found themselves so straitly besieged that they could hold out no longer, instead of thinking how to obtain honourable terms of capitulation, their chief care very often was to put their wives and children to death, and then to kill one another, to avoid being led into slavery. Their excessive love of liberty and contempt of death, according to Strabo, very much facilitated their conquest by Julius Cæsar; for, pouring their numerous forces upon such an experienced enemy as Cæsar, their want of conduct very soon proved the ruin of the whole.

The chief diversion of the Gauls was hunting; and indeed, considering the vast forests with which their country abounded, and the multitude of wild beasts which lodged in them, they were under an absolute necessity to hunt and destroy them, to prevent the country from being rendered totally uninhabitable. Besides this, however, they had also their hippodromes, horse and chariot races, tilts and tournaments; at all of which the bards assisted with their poems, songs, and musical instruments.

The Gauls were excessively fond of feasting, in which they were very profuse; as, like all other northern nations, they were great lovers of good eating and drinking. Their chief liquors were beer and wine. Their tables were very low. They ate but little bread, which was baked flat and hard, and easily broken in pieces; but devoured a great deal of flesh, boiled, roasted, or broiled; and this they did in a very slovenly manner, holding the piece in their hands, and tearing it with their teeth. What they could not part by this way, they cut with a little knife which hung at their girdle. When the company was numerous, the Coryphee, or chief of the feast, who was either one of the richest, or noblest, or bravest, sat in the middle, with the master of the house by his side; the rest took their places next according to their rank, having their servants holding their shields behind them. These feasts seldom ended without bloodshed; but, if by chance the feast proved a peaceable one, it was generally accompanied not only with music and songs, but likewise with dances, in which the dancers were armed cap-a-pee, and beat time with their swords upon their shields. On certain festivals they were wont to dress themselves in the skins of beasts, and in that attire accompany the processions in honour of their deities or heroes. Others dressed themselves in masquerade habits, some of them very indecent, and played several antic and immodest tricks. This last custom continued long after their supposed conversion to Christianity.

The ancient history of the Gauls is entirely wrapped in obscurity and darkness; all we know concerning them for a long time is, that they multiplied so fast, that, their country being unable to contain them, they poured forth in vast multitudes into other countries, which they generally subdued, and settled themselves in. It often happened, however, that these colonies were so molested by their neighbours, that they were obliged to send for-

assistance to their native country. This was always very easily obtained. The Gauls were, upon every occasion, ready to send forth great numbers of new adventurers; and, as these spread desolation wherever they came, the very name of Gauls proved terrible to most of the neighbouring nations. The earliest excursion of these people of which we have any distinct account was into Italy under a famed leader named Bellovesus, about 622 years before Christ. He crossed the Rhone and the Alps, till then unattempted; defeated the Hetrurians, and seized upon that part of their country, since known by the names of Lombardy and Piedmont. The second grand expedition was made by the Cœnomani, a people dwelling between the rivers Seine and Loire, under a general named Elitonis. They settled in those parts of Italy now known by the names of Bresciano, Cremonese, Mantuan, Carniola, and Venetian. In a third excursion, two other Gaulish nations settled on both sides of the river Po; and in a fourth, the Boii and Lingones settled in the country between Ravenna and Bologna. The time of these three last expeditions is uncertain.

The fifth expedition of the Gauls was more remarkable than any of the former, and happened about 200 hundred years after that of Bellovesus. The Senones, settled between Paris and Meux, were invited into Italy by an Hetrurian lord, and settled themselves in Umbria. Brennus their king laid siege to Clusium, a city in alliance with Rome; and this produced a war with the Romans, in which the latter were at first defeated, and their city taken and burnt; but at length the whole army was cut off by Camillus, insomuch that not a single person escaped.

The Gauls undertook some other expeditions against the Romans; in which, though they always proved unsuccessful, by reason of their want of military discipline, yet their fierceness and courage made them so formidable to the republic, that, on the first news of their march, extraordinary levies of troops were made, sacrifices and public supplications offered to the gods, and the law which granted an immunity from military service to priests and old men was, for the time, abolished.

The Romans, having often felt the effects of the Gaulish ferocity and courage, thought proper at last, in order to humble them, to invade their country. Their first successful attempt was about 118 years before Christ, under the command of Quintus Marcius, surnamed Rex. He opened a way betwixt the Alps and the Pyrenees, which laid the foundation for conquering the whole country. This was a work of immense labour of itself, and rendered still more difficult by the opposition of the Gauls, especially those called the Stœni, who lived at the foot of the Alps. These people, finding themselves overpowered by the consular army, set fire to their houses, killed their wives and children, and then threw themselves into the flames. After this Marcius built the city of Narbonne, which became the capital of a province. His successor Scaurus also conquered some Gaulish nations; and in order to facilitate the sending troops from Italy into that country, he made several excellent roads between them, which before were almost impassable. These successes gave rise to the invasion of the Cimbri and Teutones. From this time the Gauls ceased to be formidable to the Romans; and soon after their country was totally subjected unto the victorious armies of Julius Cæsar.

GAULE. See MYRTUS BRABANTICA.

GAULTHERIA, a genus of the class decandria, order monogynia. Calyx: outer, two-leaved, inner five-cleft; corol ovate; nectary with ten dagger-points; capsule five-celled, covered with the inner calyx, now become a berry. There is one species, a small but beautiful shrub of Canada.

GAULUS, in antiquity, a kind of cup.

GAUNT. *a.* (As if *gewant*, from ȝepanian, to lessen, Saxon.) Thin; slender; lean; meagre (*Shakspeare*).

GA'UNTLY. *ad.* Leanly; slenderly; meagerly.

GA'UNTLET. *s.* (*gantelet*, French.) An iron glove used for defence, and thrown down in challenges (*Cleaveland*).

GAVOT. A dance consisting of two light, lively strains in common time of two crotchets; the first of which contains four or eight bars, and the second eight or twelve, and sometimes sixteen, each beginning and ending with two crotchets, or the half of a bar.

GAVOTTA (Tempi di), an imitation of the time and movement of a gavot, without regard to the measure.

GAURA. In botany, a genus of the class octandria, order monogynia. Calyx four-cleft, tubular; corol four-petalled; the petals inclining towards the upper side; nut inferior, one-seeded, four-angled. Three species; natives of North or South America, with flowers resembling those of the œrethera or tree-primrose: two of them shrubby, or herbaceous.

GAURS, an ancient sect of the magicians in Persia. They have a suburb at Ispahan, which is called Gaurabad, or the town of the gaurs, where they are employed only in the meanest and vilest drudgery; but they chiefly abound in Kerman, the barrenest province in all Persia, where the Mahomedans suffer them to live with some freedom, and in the full exercise of their religion. Some years ago many of them fled into India, where their posterity remain. They are a poor harmless sort of people, zealous in their superstition, rigorous in their morals, and exact in their dealings; they profess the worship of one God alone, the belief of a resurrection and a future judgment, and utterly detest all idolatry, though the Mahomedans believe them to be the most guilty of it. It is true they perform their worship before fire, for which they have an extraordinary veneration, as believing it to be the most perfect emblem of the Deity. They have the same veneration for Zoroaster that the Jews have for Moses, esteeming him a prophet sent from God.

GHAUTS, mountains of Hindustan, which extend from Surat to Cape Comorin, at the distance generally of about forty miles from the sea, sometimes not more than six, and very seldom sixty. The height is not well known, but supposed to be between 3000 and 4000 feet; which will prevent the great body of clouds from passing over them; and, accordingly, the alternate north-east and south-west winds occasion a rainy season on one side of the mountains only, that is, on the windward side.

GAUZE, in commerce, a thin transparent stuff, sometimes woven with silk, and sometimes only of thread. In preparing the silk for making gauze it is wound round a wooden machine six feet high, in the middle of which an axis is placed perpendicularly, with six large wings: on these the silk is wound on bobbins by the revolution of the axis; and, when it is thus placed round the mill it is taken off by means of another instrument, and wound on two beams. This is then passed through as many small beads as it has threads, and is thus rolled on another beam in order to supply the loom. Gauzes are either plain or figured; the latter are worked with flowers of silver or gold, on a silk ground, and are chiefly imported from China. Gauzes of excellent quality have, of late years, been manufactured at Paisley.

GAWK. *s.* (ȝeac, Saxon.) 1. A cuckow. 2. A foolish fellow.

GAWN. *s.* (corrupted for *gallon.*) A small tub, or lading vessel.

GA'WNTREE. *s.* (Scottish.) A wooden frame on which beer casks are set when tunned.

GAY (John), an English poet, was born near Barnstaple in Devonshire. His family being poor, although ancient, he received no other education than what was to be had at the free-school at Barnstaple; which, however, gave him such a taste for literature, that, being afterwards put apprentice to a silk-mercer in London, he was altogether unfit for the business of the counter, and in a few years gave his master a sum of money to be released from his indentures. He now assiduously cultivated poetry, in which he chiefly delighted, and his genius and amiable manners recommended him to the friendship of several eminent persons, and among others, Swift and Pope. His first poem, entitled, Rural Sports, a Georgic, printed in 1711, and dedicated to Pope, gained him new friends; but soon after he was in a desponding state of mind, from the low condition of his finances, and he was incapable of effort when threatened by poverty. The duchess of Monmouth appointing him her secretary in 1712, his spirits revived, and he wrote, Trivia, or the Art of Walking the Streets; and the year following his Pastorals. He was now taken to Hanover by the earl of Clarendon, as the secretary of his embassy. On the death of queen Anne he returned to England, and paid his respects to the new court, where he was graciously received, but got nothing. In 1720 his finances were put in a tolerably good condition by a subscription to his poems, published in two volumes, quarto; but he lost the whole in the fatal South Sea scheme, which threw him into a violent fit of illness. On his recovery he wrote his tragedy of the Captives, which he had the honour of reading in manuscript to the princess of Wales; at whose desire he wrote his Fables for the use of the duke of Cumberland. His Beggar's Opera had a run unparalleled in the history of the stage; and though the sequel to it, called Polly, was not permitted to appear on the stage, yet as it was published by subscription, it added considerably to his finances: but the moral tendency of both these pieces was extremely bad. He died Dec. 11th, 1732, and his body was interred in Westminster-abbey, and a monument erected to his memory by his generous patrons the duke and duchess of Queensberry.

GAY. *a.* (*gay*, French.) 1. Airy; cheerful; merry; frolic (*Pope*). 2. Fine; showy (*Baruch*).

GAY. *s.* (from the adjective.) An ornament; an embellishment (*L'Estrange*).

GA'YETY. *s.* (*gayeté*, French.) 1. Cheerfulness; airiness; merriment. 2. Acts of juvenile pleasure (*Denham*). 3. Finery; show (*Shakspeare*).

GA'YLY. *ad.* (from *gay.*) 1. Merrily; cheerfully; airily. 2. Splendidly; pompously (*Pope*).

GA'YNESS. *s.* (from *gay.*) Gayety; finery.

GAZA, an ancient and celebrated town of Palestine, three miles from the sea, with a harbour called New Gaza. It is at present very small; but we may judge by the ruins that it was formerly a considerable place. There is a castle near it, where a bashaw resides. It is 50 miles S.W. of Jerusalem. Lon. 34. 45 E. Lat. 31. 28 N.

To GAZE. *v. n.* (ȝeȷean, to see, Saxon.) To look intently and earnestly; to look with eagerness (*Fairfax*).

To GAZE. *v. a.* To view stedfastly (*Milton*).

GAZE. *s.* (from the verb.) 1. Intent regard; look of eagerness or wonder; fixed look (*Spenser*). 2. The object gazed on (*Milton*).

GA'ZER. *s.* (from *gaze.*) He that gazes; one that looks intently with eagerness or admiration (*Spenser*).

GA'ZEFUL. *a.* (*gaze* and *full.*) Looking intently (*Spenser*).

GAZE-HOUND, an obsolete name for the grey-hound, but far more appropriate: the grey-hound pursuing by gaze, or sight, alone, and not by scent.

GAZELLE, in mastiology. See ANTELOPE.

GAZETTE, a newspaper or printed account of the transactions of all the countries in the known world, in a loose sheet, or half sheet. This name is with us confined to that paper of news published by authority.

The first gazette in England was published at Oxford, the court being there, Nov. 7, 1665. On the removal of the court to London the gazette was published there. In this work

are recorded all commissions and promotions in the army; all state appointments of consequence, with a variety of matters interesting to men of business and others.

GAZETTE'ER. *s.* (from *gazette.*) A writer of news.

The term has been frequently applied as the title of an alphabetical account of the principal countries, seas, counties, lakes, towns, rivers, &c. upon the earth. Thus, we have Brooks's Gazetteer, Walker's Gazetteer, Crutwell's Gazetteer, &c.

GAZING-STOCK. *s.* (*gaze* and *stock.*) A person gazed at with scorn or abhorrence.

GAZNA, a city of Asia, once much celebrated, and the capital of a very extensive empire, but which is now either entirely ruined, or become of so little consideration that it is not taken notice of in our books of geography. This city was anciently an empory and fortress of Sablestan, not far from the confines of India.

GAZONS, in fortification, turfs, or pieces of fresh earth covered with grass, cut in form of a wedge, about a foot long, and half a foot thick, to line or face the outside of works made of earth, to keep them up, and prevent their mouldering.

GAZOPHYLACIUM, in the Jewish antiquities, according to the Greek etymology of γαζα, *treasure* and φυλαττω, *I keep*, signifies the treasury chamber. Mark xii. 41. 43. Luke xxi. 1.

GAZOPHYLAX, Γαζοφυλαξ, in antiquity, an officer who had the care and management of the treasure belonging to the kings of Persia.

G DOUBLE, in music, the octave below G gammut.

GEAR. *s.* (ȝyṗran, Saxon, to clothe.) 1. Furniture; accoutrements; dress; habit; ornaments (*Fairfax*). 2. The traces by which horses or oxen draw (*Chapman*). 3. Stuff (*Shakspeare*).

GE'ASON. *a.* Wonderful (*Spenser*).

GEAT. *s.* (corrupted from *jett.*) The hole through which the metal runs into the mold (*Moxon*).

GEBER (John), an Arabian physician and astronomer, who lived in the ninth century. He wrote a Commentary on the Syntaxis Magna of Ptolemy, in nine books, in which he professed to correct the astronomy of that noted author; but Copernicus called him the calumniator of Ptolemy. He was the author of other works, and Boerhaave speaks of him as a learned chemist. His works are written in a strange jargon, insomuch that Dr. Johnson thinks the word *gibberish* is probably derived from the cant of Geber.

GECK. *s.* (ȝeac, Saxon, a cuckow.) A bubble easily imposed upon: obsolete (*Shakspeare*).

To GECK. *v. a.* To cheat; to trick.

GECHO. See LACERTA.

GED (William), an ingenious artist and goldsmith in Edinburgh, who in 1725 endeavoured to introduce a method of printing with blocks or plates, containing letters for a whole page or sheet. The Chinese and Japanese practised this method with blocks of wood, and Coster, the European inventor of the mode now usually practised, first followed their method. Ged, with others, entered into an engagement with the university of Cambridge, to print bibles and common-prayer-books in the new manner; but a large sum of money was sunk, and the project abandoned. Ged imputed the failure principally to the dishonesty and opposition of the pressmen. Having returned to Scotland, he printed an edition of Sallust, with his plates. He died in 1749, in reduced circumstances.

GEDDES (Alexander), a noted Roman catholic priest, was born at Arradowl in the county of Banff, in Sept. 1737. After receiving some private tuition, he was removed to Scalan, an obscure place of education in the Highlands; and from thence, in 1758, to the Scotch college, in Paris. During his stay here he was very attentive to his different studies, and particularly to that of the Hebrew language. He returned to Scotland in 1764, and officiated as priest to the catholics in the county of Angus: in 1765 he removed to Traquaire; and in 1769 undertook the charge of a considerable Roman catholic congregation at Auchinhalrig, in Banffshire: this charge he resigned in 1779. His great learning, which began now to be universally known among the literati of the north, obtained for him in the year 1780 a diploma, creating him Doctor of Laws, from the university of Aberdeen. This was an honour that had never, since the reformation, been conferred by that body on a Roman catholic. About this period Dr. Geddes came to London, and preached occasionally at the chapel in Duke-street, Lincoln's-inn-fields, till Easter 1782, when, we believe, he totally declined the exercise of all clerical functions. It was much earlier than this that he formed a design of giving a new Translation of the whole Bible: about the year 1760 he began to read with this view, and paid a close attention to the subject for many years. The first volume of his Translation was published in 1792, and dedicated to his patron lord Petre: it contained the first six books of the Old Testament. The 2d volume did not appear till 1797. In the preface to this volume, Dr. Geddes distinctly relinquishes, and boldly controverts, the doctrine of the absolute and plenary inspiration of the Scriptures: he places the Hebrew historians, in the scale of merit and of accuracy, much lower than the historians of Greece and Rome; and gives up as fabulous such divine commands, precepts, and injunctions, as seemed to *his* mind unworthy even of human authority. In this view of the subject he denied that the command given to destroy the Canaanites could be of divine origin; and supported his opinion by a curious specimen of argumentation: among other reasons equally as singular and nearly as ridiculous, he says he cannot believe the story of the divine command for the destruction of the Canaanites, because

if he had been one of that nation, he would not have submitted to the punishment! *Risum teneatis amici?* On this subject, we trust, the sceptical reader may peruse with advantage our article CANAANITES.—Besides the translation of the early books of the Bible, and the critical Remarks, he published some small tracts in defence of his opinions. He also wrote a Modest Apology for the Roman Catholics of Great Britain, which was published in 1800. Many lighter works, poetical, satirical, and political, are attributed to Dr. Geddes; but as they are not identified by his name, we think it unnecessary to give a list of them here. Dr. Geddes died Feb. 26, 1802. He was a man of profound and extensive erudition, of deep research, and indefatigable application: he was an enthusiastic propagator of his particular opinions respecting the scripture historians; but as these are reckoned not only erroneous but even dangerous, by the majority of Christians, it is no wonder that his publications on these subjects diminished that respect which all men of learning would otherwise have entertained for him. An interesting account of the life and writings of this erudite and extraordinary man was published by Mr. John Mason Good, F.R.S. in one vol. 8vo.

GEESE. The plural of *goose*.

GEFLE, the capital of the province of Gestrike, in Sweden. It is not far from the Baltic, and is the most commercial town in the northern part of Sweden. Lat. 63 N. Lon. 17 E.

GEGENES, Γηγενεις, a name which the ancients commonly appropriated to themselves, signifying *sons of the earth*.

GEHENNA, a scripture term, which has given some pain to the critics. It occurs in St. Matthew v. 22. 29. 30. x. 28. xviii. 9. xxiii. 15. 33. Mark ix. 43. 45. 47. Luke xii. 5 James iii. 6. The word is formed from the Hebrew *gehinnom*, i.e. valley of Hinnom. In that valley, which was near Jerusalem, was a place named *Tophet*, where children were sacrificed alive to *Moloch*. It was afterwards made a receptacle for the filth of the city, where fires were continually burning to consume it. In most of the above passages the word manifestly refers to future punishment; and is properly used to denote an unextinguishable fire.

GELATIN. In the new chemical nomenclature, a name appropriated to that extractive matter, which, on boiling animal substances in water, appears in the form of a solid but tremulous jelly. It contains much saccharine substance, and hence, contrary to what occurs in albumen, undergoes the acetous fermentation, and especially in graminivorous animals, after which it enters progressively into the putrid fermentation. From its sugar it gives out when combined with nitric acid the oxalic acid; and when distilled and dried it resembles horn.

Gelatin, according to its degree of moisture, is *mucus*, or *mucilage*; *size*, or *glue*; or *isinglass*: the first containing the greatest proportion of water, the last the smallest; and while in all these various forms resembling vegetable matter, it mostly resembles it in its *mucilaginous* state; it combines with albumen in the production of the membranes of the viscera, muscle, skin, hair, feather, scale, hoof, and nail; the softest of all which, or those possest of the largest portion of gelatin, are the substances most easily disposed to putrefaction.

The component parts of gelatin, when chemically analyzed, are carbon, hydrogen, azot, saccharine matter, phosphoric acid, muriatic acid, and lime of soda. It exists in the blood, in conjunction with albumen and fibrin, and is one of the chief elementary substances of the animal frame.

Animal mucus, or mucilage, is a somewhat clammy, insipid, whitish, or colourless fluid; uncoagulable by heat, but leaving, after a gentle evaporation to dryness, a small proportion of slimy tenacious matter, much resembling gelatin in appearance, and in being equally resoluble in water. The saliva is perhaps the best example of simple animal mucilage in the human body, but it is found more copiously in other animals, as, for example, in the snail, and the oyster. In some respects animal mucus differs from gelatin; for it is readily soluble in cold water, and has no proper gelatinizing power, or, in other words, a hot solution does not stiffen it, nor does it approach apparently more to the solid state by cooling; its degree of viscidity seeming to depend simply on the proportion of water in the solution, without regard to temperature. Mr. Hatchett, however, considers mucus as a species of gelatin, though at the opposite extreme of tenacity from the stiffest glue obtained from condensed skin.

One of the most singular combinations of gelatin, and that which is most useful as a chemical test, is with *tan*. If a solution of gelatin, of glue, for example, or isinglass, be added to an infusion of oak bark, galls, catechu, or any other vegetable that contains the tanning principle, a copious white precipitate separates, which, when the respective liquors are concentrated, may be collected by the fingers with great ease, and forms a singular grey ductile mass, smelling like tanned leather, and which dries into a dark, brown brittle mass, of the appearance of resin, insoluble in water, and incapable of putrefaction.

The species of gelatin called *glue*, is supposed to be made with greater perfection in this country than in any other, and hence, is in great repute as an article of commerce. It is manufactured from the parings of hides or horns of any kind, the pelts obtained from furriers, the hoofs and ears of horses, oxen, calves, sheep. These are first cleaned by being digested in lime-water: they are then boiled in a cauldron with water, the filth that remains being skimmed off as it rises, and a little alum or lime being added to assist the cleansing still farther. The mass is then strained through baskets and suffered to settle, to be still further exonerated of its impurities. It is then returned to the kettle, and farther evaporated by boiling, till it becomes of a clear

darkish-brown colour. When it is judged sufficiently strong, it is poured into frames or moulds, where it gradually hardens as it cools, and is cut out when cool by a spade into square cakes; each of which is afterwards cut into slices by an instrument like a bow, with a brass wire for its string. The slices are dried on nets in the open air, placed in rows in the glue-maker's field. To know good from bad glue, the purchaser should hold it between his eye and the light; when, if it appear of a strong dark colour and free from cloudy or black spots, it is well prepared.

Size, is a gelatinous cement of less firmness than glue, and made for the use of paper-hangers, gilders, book-binders, house-painters in distemper, and many other trades, by boiling down in water the clippings of parchments, glove-leather, fish-skin, and many other kinds of animal membrane. These are used either alone or mixed with vegetable tenacious substances, such as flour-paste, gum-arabic, or tragacanth. The preparation of these gellies is perfectly simple, the substances used (parchment shreds for example) being simply dissolved in water by boiling, strained and evaporated to a due consistence. Eel-skins, and skins of other fishes, make a cement, which is much valued for its transparency and tenacity.

Isinglass, among the kind of cements referred to in the close of the preceding paragraph, is most valued and in most general use. It is a thin, tough, whitish membrane, in the form of irregular shreds or clippings, loosely coiled up, and of different degrees of fineness and flexibility, procured from several parts of the entrails of various fishes, with scarcely any other artificial preparation than that of extracting, cleansing, and drying.

The fishes that chiefly afford isinglass are those of the northern seas and rivers. The Volga, Lyak, Don, and Danube, and especially the Caspian, yield very large quantities of these: many of them are to be found even in Siberia, known by the name of kle or kla, from being filled with gluey matter. In Muscovy, therefore, isinglass is chiefly prepared: the best sorts from the air-bladders of the sturgeon and the sterled (both species of the ACIPENSER, which see). After these a fish called serrijonga gives the next in quality, and lastly the beleuga, the delphinus leucas, as we conjecture. See DELPHINUS.

In making isinglass, after the air-bladder has been extracted, it is washed with water, to clean it of the blood if any remains, but not otherwise. It is then cut lengthways, and the exterior membrane taken off, which is of a brown colour, whilst the other membrane already mentioned is so fine and white, as to be taken from the fish with difficulty. They are first formed into rolls of the thickness of the finger, placing the fine membrane in the middle, and are then suspended in the air to dry. The substance, however, is often converted into various shapes at the fancy of the manufacturer.

A coarser kind of isinglass is obtained by boiling the head, tail, bones, cartilages, or fins of such fishes as sea-wolves, porpoises, sea-cows, sharks, cuttle-fish, whales, and indeed almost any kind of fishes, in water after the manner of preparing glue; which, like glue, is afterwards cleared, and poured out to dry in cakes. This sort is very useful for the purpose of clarifying wines and other liquors; for stiffening silks and gauzes; for joining pieces of glass or porcelain; for making artificial pearls; and forming English sticking-plaister. According to Hatchett, 500 grains of isinglass perfectly exsiccated yielded 56 grains of coal, from which a grain and a half of phosphat of soda was extracted, mixed with a very minute proportion of phosphat of lime.

GE'LABLE. *a.* (from *gela*, Latin.) What may be congealed, or concreted into a gelly.

GE'LATINE. GELA'TINOUS. *a.* (*gelatus*, Lat.) Formed into a gelly; viscous; stiff and cohesive (*Derham. Woodward*).

GELD, in our old customs, a Saxon word, signifying money, tribute, or mulct.

To GELD. *v. a.* preter. *gelded* or *gelt*; part. pass. *gelded* or *gelt*. (*gelten*, German.) 1. To castrate; to deprive of the power of generation (*Shakspeare*). 2. To deprive of any essential part (*Shakspeare*). 3. To deprive of any thing immodest, or liable to objection (*Dryden*).

GE'LDER. *s.* (from *geld*.) One that performs the act of castration (*Hudibras*).

GELDER ROSE, in botany. See VIBURNUM.

GE'LDING. *s.* (from *geld*.) Any animal castrated, particularly a horse.

GELDING, a term used to denote the operation of castrating horses; and used also for a horse so castrated, or whose testicles have been extirpated. See CASTRATION.

GELHAUSEN, an imperial town of Wetteravia, in Germany. Lat. 50. 7 N. Lon. 9. 15 E.

GELENIUS (Sigismund), a learned man, born at Prague in 1498. He was the intimate friend of Erasmus, who recommended him to Frobenius as corrector of his press. He died at Basil about 1555. He translated several valuable authors from the Greek into Latin.

GE'LID. *a.* (*gelidus*, Latin.) Extremely cold (*Thomson*).

GELI'DITY. GE'LIDNESS. *s.* (from *gelid*.) Extreme cold.

GELLERT (Christian Furchtegott), a celebrated German poet, was born at Hayinchen, a village in Misnia, in 1715, and died in 1769. He supported himself for many years as tutor in private families; but was afterwards professor of philosophy at Leipsic. He is best known for his Fables and Tales.

GELLI (John Baptist), an Italian writer, remarkable for uniting one of the lowest occupations of life with great literary attainments, was born at Florence in 1498, where he died in the 65th year of his age. His occupation was that of a taylor, which he continued to follow till his death, although he was the author of several works, was a member of the

academy at Florence, and admitted to the friendship of all the men of genius and learning in that city. He wrote Dialogues, in the manner of Lucian, which were translated into Latin, French, and English; he also wrote some comedies, and Dissertations on the poems of Dante and Petrarch.

GELLIBRAND (Henry), a laborious astronomer of the last century, was born in 1597. Though he was not without good views in the church, yet he became so enamoured with mathematical studies, that on the death of his father he became a student at Oxford, contented himself with his private patrimony, and devoted himself solely to them. On the death of Mr. Gunter, he was recommended by Mr. Briggs to the trustees of Gresham college, for the astronomical professorship there; to which he was elected in 1627. His friend Mr. Briggs dying in 1630, before he had finished his Trigonometrica Britannica, it was finished by Gellibrand at his request. He wrote several other things, chiefly tending to the improvement of navigation, and died in 1636.

GELLIUS (Aulus), a celebrated ancient grammarian. He was born in the reign of Trajan, and died in the beginning of that of Marcus Aurelius. After studying grammar and rhetoric at Rome, he went to Athens; and on his return to Rome was made a judge. His Noctes Atticæ, Attic Nights, is a curious and valuable work. It has gone through a variety of editions, and been translated into English by Mr. Beloe.

GE'LLY. *s.* (*gelatus*, Lat.) Any viscous body; viscidity; glue; gluy substance (*Dryden*).

GELT. *s.* (from *geld.*) A castrated animal; gelding: not used (*Mortimer*).

GELT. The part. pass. of *geld*.

GELT. *s.* Tinsel; gilt surface (*Spenser*).

GEM. *s.* (*gemma*, Latin.) 1. A jewel; a precious stone of whatever kind (*Shakspeare*). 2. The first bud (*Denham*).

To GEM. *v. a.* (*gemma*, Latin.) To adorn, as with jewels or buds.

To GEM. *v. n.* (*gemmo*, Lat.) To put forth the first buds (*Milton*).

GEM, in mineralogy. (See GEMMA), under which article we shall notice the greater number of those which are most esteemed, or of greatest notoriety, and which, in a classical arrangement, belong to this genus.

In common language, however, the term is used more loosely; so loosely indeed that it is difficult to give a definition of its meaning. "Nature," says Boetius de Boot, in his treatise De Gemmis, "forms some stones large and others small; of the small, some are of rare occurrence, others are common; of the rare, some are hard, others are soft; of the hard, some are beautiful and pleasant to the sight, others are mean. The beautiful merit the name of gems. Hence the word gem signifies a natural stone of small size, rare, hard, and beautiful."

Between precious stones and gems the ancients appear to have made a difference; comprehending under the former term such hard and beautiful, but imperfectly crystallised stones, as agate, cornelian, onyx, and other species of chalcedony, as well as various species of jasper; restricting the word gem to those stones which, on account of their minuteness, extreme hardness, and brilliant lustre, were worn in rings, as the preceding were as seals, either in the state in which nature presents them, or after being cut and polished. Some stones, however, as the topaz and amethyst, being commoner and in larger pieces than most of the other gems, held a kind of middle rank between these and the precious stones, being sometimes employed as materials to engrave upon, and sometimes used plain for necklaces, rings, and similar ornaments.

All these we have separately described in their proper places: it only remains for us, therefore, under the present article, to give a list of those which are denominated gems by modern lapidaries: which list we shall arrange in four classes according to their relative estimation; premising, however, that this order is subject to some variations, from the casual plenty or scarcity of any particular kind, and from the caprice of fashion.

The diamond and the oriental ruby constitute the first class. Of these a very small diamond is more valuable than a ruby of equal weight: but rubies of ten carats or more being much rarer than diamonds of equal weight, bear a somewhat higher price in the market. The second class of gems contains the emerald, star-stone, oriental girasol, sapphire, spinal, and balais rubies, oriental topaz, oriental amethyst, and noble opal. In the third rank are found the jargon, cat's-eye, oriental chrysolite, hyacinth, and peridot. Those in the fourth and lowest class are often engraved upon, and form the most valuable seal-stones: they are the beryl, or aqua marina, Brazilian topaz, Saxon topaz, Syrian garnet, Bohemian garnet, and European amethyst.

GEMS (Artificial). See the article GLASS (Coloured).

GEMARA, or GHEMARA, the second part of the Talmud. The word גמרא, *gemara*, is commonly supposed to denote a supplement; but in strictness it rather signifies complement, perfection: being formed of the Chaldee גמר, *gemar* or *ghemar*, to finish, perfect, or complete any thing. The rabbins call the Pentateuch simply the law: the first part of the Talmud, which is only an explication of that law, or an application thereof to particular cases, with the decisions of the ancient rabbins thereon, they call the *Mischna*, i. e. second law: and the second part, which is a more extensive and ample explication of the same law, and a collection of decisions of the rabbins posterior to the Mischan, they call *Gemara*, q. d. perfection, completion, finishing; because they esteem it the finishing of the law, or an explication beyond which there is nothing farther to be desired.

The Gemara is usually called simply Tal-

mud, the common name of the whole work. In this sense we say, there are two Gemaras or Talmuds, that of Jerusalem and that of Babylon, though in strictness the Gemara is only an explication of the Mischna, given by the Jewish doctors in their schools; much as the commentaries of our school-divines on St. Thomas, or the master of the sentences, are an explication of the writings of those authors. A commentary, Mons. Tillemont observes, was written on the Mischna by one Jochanan, whom the Jews place about the end of the second century: but Fa. Morin proves, from the work itself, wherein mention is made of the Turks, that it was not written till the time of Heraclius, or about the year 620; and this is what is called the Gemara or Talmud of Jerusalem, which the Jews do not use or esteem much because of its obscurity. They set a much greater value on the Gemara or Talmud of Babylon, begun by one Asa; discontinued for seventy-three years, on occasion of the wars with the Saracens and Persians; and finished by one Josa about the close of the seventh century. See TALMUD.

GEMATRIA, or GAMETRIA, the first kind of artificial cabbala used by the Jews. The word is formed from the rabbinical Hebrew [illegible], by corruption of the Greek. Gematria is a geometrical or arithmetical method of explaining these words, whereof there are two kinds; the first bearing a more immediate relation to arithmetic, and the latter to geometry. The rules of the gematria are too frivolous to justify our enlarging upon them.

GEMBLOWES, a town of Brabant, in the Austrian Netherlands, 22 miles S.E. of Brussels. Lat. 50. 37 N. Lon. 4. 51 E.

GEME'LLIPAROUS. *a.* (*gemelli* and *pario*, Latin.) Bearing twins.

To GE'MINATE. *v. a.* (*gemino*, Lat.) To double.

GEMELLUS. (*gamellus*, from *geminus*, double, having a fellow.) In myology. See GASTROCNEMIUS and GEMINI.

GEMINATE, in botany, double. Applied to leaves, stipules, and peduncles. See DOUBLE.

GEMINATION. *s.* (from *geminate.*) Repetition; reduplication (*Boyle*).

GEMINI, in astronomy, the twins; a constellation, or sign of the zodiac, the third in order, representing Castor and Pollux: it is marked thus, ♊. The more ancient Egyptians, and Eastern nations, depicted this sign by a couple of young kids, which were afterwards changed to two children. The constellation is now reckoned to contain 84 stars of the first six magnitudes, i. e. 1. 2. 4. 8. 13. 56.

GE'MINI. In anatomy. Gemelli of Winslow. This muscle has been a subject of dispute among anatomists since the days of Vesalius. Some describe it as two distinct muscles, and hence the name it has gotten of gemini. Others contend that it ought to be considered as a single muscle. The truth is, that it consists of two portions, which are united together by a tendinous and fleshy membrane, and afford a passage between them to the tendon of the obturator internus, which they inclose as it were in a purse. These two portions are placed under the glutæus maximus, between the ischium and the great trochanter.

The superior portion, which is the shortest and thickest of the two, arises fleshy from the external surface of the spine of the ischium; and the inferior, from the tuberosity of that bone, and likewise from the posterior sacro-ischiatic ligament. They are inserted, tendinous, and fleshy, into the cavity at the root of the great trochanter. Between the two portions of this muscle, and the termination of the obturator internus, there is a small bursa mucosa, connected with both, and with that part of the capsula of the joint which lies under the gemini.

This muscle assists in rolling the os femoris outwards, and prevents the tendon of the obturator internus from slipping out of its place while that muscle is in action.

GEMINIANI (Francesco), a celebrated performer on the violin, and musical composer, was born at Lucca in Italy, about 1680. He came to England in 1714, where he was introduced to George I. at whose court he met with friends. But he was a man of most independent mind, and refused several offers of services from the great. He was, however, capricious, and passed his life in various countries; sometimes in distressed circumstances. He died in 1762. The following list comprises the whole of his publications, except two or three articles of small account. Twelve solos for a violin, *opera prima*; six concertos in seven parts, *opera seconda*; six concertos in seven parts, *opera terza*; twelve solos for a violin, *opera quarta*; six solos for a violincello, *opera quinta*; the same made into solos for a violin; six concertos from his *opera quarta*; six concertos in eight parts, *opera settima*; rules for playing in taste; a treatise on good taste; the art of playing the violin; twelve sonatas from his first solos, *opera undecima*; Ripieno parts to ditto; lessons for the harpsichord; Guida Armonica; supplement to ditto, the art of accompaniment, two books; his first two operas of concertos in score; and the Enchanted Forest. Of his solos the *opera prima* is esteemed the best. Of his concertos some are excellent, others of them scarce pass the bounds of mediocrity. The sixth of the third opera not only surpasses all the rest, but, in the opinion of the best judges of harmony, is the finest instrumental composition extant.

GE'MINOUS. *a.* (*geminus*, Lat.) Double (*Br.*).

GEMMA (Reinier), frequently named Gemma Frisius, was a Dutch physician, a native of Friseland, who practised at Louvain. He was well versed in astronomy, on which he wrote several works, as well as on other branches of mathematics. He died in 1555, at the age of 47. His son, Cornelius Gemma, was famous for his knowledge of mathematics. He died in 1579, at the age of 44.

GEMMA, in botany, a gem or bud. See BUD.

GEMMA, in oryctology, a genus of the class earths, order siliceous: consisting of silex, and a larger proportion of alumine, with sometimes a little carbonat of lime and oxyd of iron; meagre to the touch, of a high internal lustre, very rarely opaque or subopaque, never hardish or soft, breaking into indeterminate fragments, parasitic, shining in the dark, attracting light bodies when heated by friction: not melting with alkalies. Seventeen species; found in different parts of the globe.

1. G. rubinus. True or oriental ruby; perfect corundum. Very hard, ponderous, red, of a foliated texture, which in a contrary direction is conchoidal, not melting or losing its lustre in the fire. Found in Brazil and the East Indies, principally in the kingdoms of Peru and Ceylon, and is, except the diamond, the most precious of all the gems: the colour varies a little, being carmine red, sometimes verging to violet, mixt carmine, and hyacinth red, red and white, red and blue, or orange red; is found in angular pieces in small pebbles, or in regular six-sided pyramids, joined to and opposed base to base: seldom exceeding an inch in size: when finely powdered, melting with borax, though with difficulty into a green glass.

2. G. sapphirus. Sapphire; oriental sapphire. Perfect corundum. Very hard, somewhat ponderous, blue, making a white streak, of a slightly incurved lamellar texture, not fusible, but losing its colour in a strong heat. Found in Brazil, the Indies, Persia, Bohemia, and near Puys in Velay, sometimes crystallized, sometimes in rounded masses, the angles being worn off by friction; and is next in value to the ruby: colour sky-blue, or the shades of Prussian and indigo-blue, with sometimes white specks; the crystals are strong, shining, and exhibit a foliated texture transversely striate: they become colourless when heated with microcosmic salt, and emit a great light while burning.

3. G. topazius. Topaz. Imperfect corundum. Nearly very hard, ponderous, yellow, of a foliated texture, which is conchoidal when broken transversely, not fusible *per se*, but losing all its colour in a strong heat. Found in India, Brazil, Russia, Saxony, Bohemia, &c. generally adhering to other substances, though sometimes detached with the angles worn off; colour a higher or deeper yellow, most commonly honey-coloured, sometimes verging to white or greenish; its fragments sometimes irregular, sometimes granular or prismatic; the prisms longitudinally striate, solitary, in pairs, or in threes, disposed in a cruciate manner; often clustered; rarely four-sided, rectangular or oblique-angular; loses its colour only in a very high degree of heat; melts with borax into clear glass.

4. G. hyacinthus. Hyacinth, Zircon, Jargon. Hard; lamellar; of a peculiar yellowish-red, in four-sided prisms, terminated on both sides by a four-sided pyramid, not fusible *per se*, but losing its colour in a strong heat. Found in the East, and in Bohemia, in the form of pebbles, in obtuse angular pieces; colour yellowish-red, with a mixture of brown; the crystals are small, have a smooth surface, and foliated texture: they are imitated by heating rock crystals, and putting them into a solution of dragon's blood.

5. G. alanbandica. Found in the river Goetch near Lengefeld, in the form of rounded granulations, from the size of a pea to that of a bean. When exposed in a strong heat surrounded with wood ashes, loses its red colour, and is often sold for the diamond.

6. G. aquamarina. Aquamarine. Hard, pellucid, lamellar, pale sea-green, not fusible *per se*, breaking into trapezoidal fragments. Found in Brazil, India, Siberia, Saxony, Bohemia, sometimes amorphous, sometimes crystallized in equiangular six-sided prisms, longitudinally striated: its longitudinal fracture rather conchoidal, its transverse fracture foliated; colour rarely a blueish-green: it decrepitates when heated, and is generally a little discoloured, but does not melt; becomes electric by friction, when one of its poles is attractive, the other repulsive.

7. G. spinallus. Spinell and balass ruby. Hard, of a pale red colour, inclining to orange; not fusible, but losing its colour in a strong heat. Found in Ceylon in six-sided crystals.

8. G. euclasius. Euclase. Hard, pellucid, lamellar, green, in four-sided oblique prisms, whose edges are variously truncate, and whose faces are oblique. Found in Peru: very brittle, and sufficiently hard to scratch quartz.

9. G. schorlites. Schorlite. Hardish, somewhat ponderous, diaphonous, of a greenish or yellowish-white colour, which is not altered by the fire; not fusible *per se*. Found in Brazil and Saxony, with mica or quartz.

10. G. beryllus. Beryl. Hard, of a blue-green colour, not altering its colour or fusible by heat, of a conchaceous texture, which is foliated when broken transversely, in six-sided prisms, which are usually longitudinally striate. Found in the mountains of Saxony, Siberia, &c. in quartz, granite, wolfram, and other matrices; its crystals of various magnitude and pellucidity, sometimes with a greenish, blueish, or yellowish tinge.

11. G. chrysolithus. Chrysolite. Hardish, pellucid, lightish, of a green colour, which vanishes in a strong heat, fusible by the blowpipe, and sparkling when melted; of a conchoidal texture. Found in Brazil, Ceylon, Siberia, Transylvania, and Bohemia, in angular fragments, grains, and crystallized.

12. G. chrysoberyllus. Chrysoberyl. Hard, pellucid, green, highly shining internally, of a conchaceous texture. Found in Brazil and Ceylon, in round masses, about the size of a pea or crystallized.

13. G. smaragdus. Emerald. Hard, pellucid, lightish, grass-green; when heated to 120° of wedgewood, becomes blue, but recovers its green colour when cold; melts before the blow-pipe; of a conchoidal texture. Found

in the mountains of Egypt and Ethiopia, in Peru, Russia, and on the confines of Persia.

14. G. granatus. Garnet. Hard, ponderous, red, of unequal texture, preserving its colour in a low heat; melting, in a stronger heat, into a brown, opaque, spumid mass. There are many varieties of this species, which differ in colour, or pellucidity, or angularity. Found in Britain, and various other parts of Europe, Madagascar, Ethiopia, India, Syria, sometimes in mass, sometimes crystallized. The other three species, which are scarcely worth particularizing, are,

15. G. granadillus. Red schorl.

16. G. loranus. Gem granite.

17. G. rubicellus. Brazilian ruby.

GE'MMARY. *a.* (from *gem.*) Pertaining to gems or jewels (*Brown*).

GEMMATION, in botany, budding. The construction of the bud; of leaves, stipules, petioles, or scales.

GE'MMEOUS. *a.* (*gemmeus*, Latin.) 1. Tending to gems (*Wood*). 2. Resembling gems.

GEMMEUM, in Roman antiquity, properly signifies a vase or cup, cut out of a single stone.

GEMMINGEN, a town of the palatinate of the Rhine, in Germany. Lat. 49. 6 N. Lon. 9. 13 E.

GEMMI'PAROUS, in botany, producing gems or buds.

GEMONIÆ SCALÆ, or GRADUS GEMONII, among the Romans, was much the same as a gallows, or gibbet, in England.

GEMOTE, a Saxon word, denoting a meeting or assembly.

GENDARMES, or GENS D'ARMES, q. d. men of arms, a term used among the French for a select body of horse-guards; because they succeeded the ancient men of arms, who were armed at all points, and thence were called gendarmes.

GENDARMES (Scots), were originally instituted by Charles VII. of France about the middle of the fifth century, and formed a part of his guard; in which station also they acted under other princes. It was their prerogative to take precedence of all the companies of the gendarmerie of France, and on particular occasions they even preceded the two companies of the king's mousquetaires. The sons of the Scottish monarchs were the usual captains of this company; and, after Mary's accession to the throne, its command belonged to them as a right.

GE'NDER. *s.* (*genus*, Latin.) 1. A kind; a sort: not in use (*Shakspeare.*) 2. A sex.

GENDER, among grammarians, a division of nouns or names to distinguish the two sexes. This was the original intention of gender: but afterwards other words, which had no proper relation either to the one sex or the other, had genders assigned them, rather out of caprice than reason, which [illegible] established by [illegible] to the [illegible] in- [illegible] other [illegible] in French is masculine; and *dens* in Latin is masculine, but *dent* in French is feminine.

The oriental languages frequently neglect the use of genders, and the Persian language has none at all. The Latins, Greeks, &c. generally content themselves to express the different genders by different terminations; as *bonus equus*, a good horse; *bona equa*, a good mare, &c. But in English we frequently go further, and express the difference of sex by different words: as boar, sow; boy, girl; buck, doe; bull, cow; cock, hen; dog, bitch, &c. We have only about twenty-four feminines, distinguished from the males by the variation of the termination of the male into *ess*; of which number are abbot, abbess; count, countess; actor, actress; heir, heiress; prince, princess, &c. which is all that our language knows of any thing like genders. The Greek and Latin, besides the masculine and feminine, have the neuter, common, and the doubtful gender; and likewise the epicene, or promiscuous, which, under one single gender and termination, includes both the kinds.

To GE'NDER. *v. a.* (*engendrer*, French.) 1. To beget. 2. To produce; to cause (*Tim.*).

To GE'NDER. *v. n.* To copulate; to breed.

GENDRE (Louis le), a French historian, who was descended from an obscure family at Rouen, was born in 1659, and died in 1733. His principal works are, a History of France, in 3 vols. folio; the Life of Harley; an Essay on the Reign of Louis the Great; and a Life of Cardinal d'Amboise.

GENDRE (Gelbert Charles le), marquis of St. Aubin, a French writer of considerable merit, was counsellor of the parliament of Paris, and master of requests. He died in 1746, at the age of fifty-nine. His principal work is, a Treatise on Opinion, 12mo.

GENEALO'GICAL. *a.* (*genealogy.*) Pertaining to descents or families.

GENEA'LOGIST. *s.* (γενεαλογέω; *genealogist*, French.) He who traces descents.

GENEA'LOGY. *s.* (γενεὰ and λόγος.) History of the succession of families (*Burnet*).

GENERA, in BOTANY and ZOOLOGY. See those articles.

GENERA, in music, the different scales by which the Greeks regulated their division of the tetrachord: these, as agreed by Aristoxenus, Bacchius, Euclid, Boethius, and other ancient writers, were principally three; the ENHARMONIC, CHROMATIC, and DIATONIC. (See those words.) Aristides Quintilian, however, mentions many other genera, and enumerates six as very ancient, viz. the Lydian, Dorian, Phrygian, Ionian, Mixolydian, and Syntonolydian. These six genera, which we must not confound with the tones or modes of the same names, differed no less in their degrees than in their compass. The one did not extend to the octave, while others reached, and some exceeded it. Independent of the various subdivisions of the three principal genera, there was a common genus, consisting only of the stable sounds of the genera; as also a mixed genus, partaking of two, or of all the three genera.

It is worthy of notice, that in this collection or combination of genera, which was rarely used, not more than four chords or strings were employed, which were tightened or relaxed during performance: a practice of great apparent difficulty, and of which we can have no true idea. Indeed, the whole musical system of the ancients being only conveyed to us by speculative authors, and not by any continuance of its practice, we are necessarily left in great uncertainty respecting its execution, nor will the varying accounts of the different writers on the subject afford us a permanent resting place for our opinions concerning the niceties of its theory. (*Busby's Dict. Mus.*).

GE'NERABLE. *a.* (from *genero*, Latin.) That may be produced or begotten.

GE'NERAL. *a.* (*general*, Fr.) 1. Comprehending many species or individuals; not special; not particular (*Broome*). 2. Lax in signification; not restrained to any special or particular import (*Watts*). 3. Not restrained by narrow or distinctive limitations (*Locke*). 4. Relating to a whole class or body of men, or a whole kind of any being (*Whitgift*). 5. Public; comprising the whole (*Milton*). 6. Not directed to any single object (*Sprat*). 7. Extensive, though not universal. 8. Common; usual (*Shakspeare*).

GE'NERAL. *s.* 1. The whole; the totality (*Norris*). 2. The public; the interest of the whole. 3. The vulgar (*Shakspeare*).

GENERAL, in a military sense, is an officer in chief, to whom the prince or senate of a country have judged proper to intrust the command of their troops. He holds this important trust under various titles: as captain-general in England and Spain; feldt-mareschal in Germany, or mareschal in France.

In the British service the king is, constitutionally, and in his own proper right, captain-general. He has ten aide-de-camps; every one of whom enjoys the brevet rank of full colonel in the army. Next to his majesty is the commander in chief, whom he sometimes honours with the title of captain-general.

The natural qualities of a general are a martial genius, a solid judgment, a healthy robust constitution, intrepidity and presence of mind on critical occasions, indefatigability in business, goodness of heart, liberality, a reasonable age; if too young, he may want experience and prudence; if too old, he may not have vivacity enough. His conduct must be uniform, his temper affable, but inflexible in maintaining the police and discipline of an army.

The acquired qualities of a general should be secrecy, justice, sobriety, temperance, knowledge of the art of war from theory and practice, the art of commanding and speaking with precision and exactness, great attention to preserve the lives and supply the wants of the soldiers; and a constant study of the characters of the officers of his army, that he may employ them according to their talents. His conduct appears in establishing his magazines in the most convenient places; in examining the country, that he may not engage his troops too far, while he is ignorant of the means of bringing them off; in subsisting them, and in knowing how to take the most advantageous posts, either for fighting, retreating, or shunning a battle. His experience inspires his army with confidence, and an assurance of victory; and his quality, by creating respect, augments his authority. By his liberality he gets intelligence of the strength and designs of the enemy, and by this means is enabled to take the most successful measures. He ought to be fond of glory, to have an aversion to flattery, to render himself beloved, and to keep a strict discipline and regular subordination.

The office of a general is to regulate the march and encampment of the army; in the day of battle to chuse out the most advantageous ground; to make the disposition of the army; to post the artillery, and where there is occasion, to send his orders by his aide-de-camps. At a siege he is to cause the place to be invested, to regulate the approaches and attacks, to visit the works, and to send out detachments to secure the convoy and foraging parties.

General of Horse, and *General of Foot*, are posts next under the general of the army, and these have upon all occasions an absolute authority over all the horse and foot in the army.

General of the Artillery, or *Master General of the Ordnance*. See ORDNANCE.

GENERAL, is also used for a particular march, or beat of drum, being the first which gives notice, commonly in the morning early, for the infantry to be in readiness to march.

GENERAL, is also used for the chief of an order of monks; or of all the houses and congregations, established under the same rule. Thus we say, the general of the Franciscans, Cistercians, &c.

GENERALISSIMO, a supreme and absolute commander in the field. This word is generally used in most foreign languages. It was first invented by the absolute authority of cardinal Richelieu, when he went to command the French army in Italy.

GENERA'LITY. *s.* (*generalité*, French.) 1. The state of being general (*Hooker*). 2. The main body; the bulk (*Tillotson*).

GE'NERALLY. *ad.* (from *general.*) 1. In general; without specification or exact limitation (*Bacon*). 2. Extensively, though not universally. 3. Commonly; frequently. 4. In the main; without minute detail (*Swift*).

GE'NERALNESS. *s.* (from *general.*) Wide extent, though short of universality; frequency; commonness (*Sidney*).

GE'NERALTY. *s.* (from *general.*) The whole; the totality (*Hale*).

GE'NERANT. *s.* (*generans*, Latin.) The begetting or productive power (*Glanville*).

To GE'NERATE. *v. a.* (*genero*, Latin.) 1. To beget; to propagate (*Bacon*). 2. To produce to life; to procreate (*Milton*). 3. To cause; to produce (*Arbuthnot*).

GENERATION. *s.* (*generation*, French.) 1. The act of begetting or producing (*Bacon*).

2. A family; a race (*Shak.*). 3. Progeny; offspring (*Shak.*). 4. A single succession (*Raleigh*). 5. An age; about 33 years (*Hooker*).

GENERATION, a sexual action for the purpose of propagating life, performed in different ways among different animals; some of which have the powers of both sexes in the same individual, others, and by far the larger part, the powers divided between male and female individuals.

The females of quadrupeds have a matrix, separated into two cavities, uterus bicornis, and a considerable number of teats: excepting a few species of simia they have no menstrual flux; most of them bear several young at a time, and the period of their gestation is generally short. The generation of birds is very different. The males have a strong genital organ, which is often double. The vulva in females is placed within and behind the anus; the ovaries have no matrices, and there is a duct for the purpose of conveying the egg from the ovarium into the intestines: this passage is called the oviduct. The eggs of pullets have exhibited unexpected facts to physiologists who have examined the phænomena of incubation. The most important discoveries are those of the immortal Haller, who persuaded himself that he had found the chicken perfectly formed in eggs which were not fecundated: a fact however that wants much confirmation. There is no determinate conjunction between fishes, excepting the squalus or shark; the female deposits her eggs on the sand, over which the male passes, and emits its seminal fluid, doubtless for the purpose of fecundating them; these eggs are hatched after a certain time. The males of several oviparous quadrupeds have a double or forked organ. Insects exhibit all the varieties which are observed in other animals. The organ of the male is usually armed with two hooks to seize the female: the place of these organs is greatly varied; with some, it is at the upper part of the belly near the chest, as in the female dragon fly; in others, it is at the extremity of the antenna, as in the male spider. Most worms are hermaphrodite; each individual has both sexes. Polypes, with respect to generation, are singular animals: they produce by buds or offsets: a bud is separated from each vigorous polype, which is fixed to some neighbouring body and grows.

The polypules, or young polypes, are likewise found on the surface of the parent worm, germinating in the same manner as branches issue from plants.

Such is a glance at the difference of the sexual organs in different classes of animals. To give even an equal glance at the different theories which have endeavoured to account for the production of life upon the prolific conjunction or mere action of these organs, would carry us far beyond our limits.

The following, however, which is equally brief and comprehensive, we shall beg leave to [illegible] translation of Lucretius, vol. ii. p. 198. "Omitting an infinite variety of offsets and abortive systems which have been generated and have existed for a short time, from this fertile subject, there are three that deserve our particular attention; that which contends that the animal, or rather the human fetus, for we are now principally bending our attention to our own species, is the conjoint production of seminal matter afforded in coition by both sexes, which has been termed the theory of *epigenesis*; that which asserts that the female alone affords the basis of the embryon; and that which affirms it to be the total production of the male; both which latter have been denominated theories of *evolution*.

"The second hypothesis in the present arrangement, or that contending for the production of the fetus from female rudiments alone, was originally advanced by Josephus de Aromatariis; but it was principally brought into notice by Swammerdam and Harvey. Observing a vast cluster of vesicles in the female ovarium, an organ situated on each side of the uterus or womb, and in its immediate vicinity, though only mediately connected with it by means of the Fallopian tube and vasa deferentia, and perceiving that these vesicles appeared to diminish in number in some kind of proportion to the number of parturitions a woman had sustained, they successively determined that these vesicles must be inert eggs, or ovula, containing in extreme embryo a perfect miniature of the form assumed afterwards; which, by the pleasurable shock sustained throughout the whole body in the immediate act of coition, but more directly by themselves from proximity of situation, are instantaneously thrown into a state of vital activity, are detached from the common cluster of which they constitute a part, and in a short time pass into the uterus through the canal of the Fallopian tube, which spontaneously enlarges for the purpose; where, by the genial powers of the uterus itself, the incipient embryon is gradually evolved and augmented into a perfect fetus, and partakes of the common form and properties of the parent stock. The little animal, it was maintained by Harvey, might be occasionally impressed with an organic resemblance to the father from the electric impulse communicated in copulation to every portion of the fluids and solids of the body, and, of consequence, to the essential humour of the ova themselves: but, reasoning from the length of the vagina in cows, and many other animals, and his own occasional dissections of the human subject shortly after coition, he contended that the emitted fluid of the male never could enter the uterus, and, of course, could not mechanically assist in the evolution of the contained embryo.

"Leewenhoek and Hartsoeker, however, upon a more accurate anatomy of the uterus immediately after copulation, discovered not only that the projected male fluid could enter into its cavity, but that it actually did thus enter; and in some instances which fell beneath their notice, had obviously ascended into the Fallopian tubes. And now a new doctrine was

started, and one altogether opposite to the theory of Harvey. Upon the principle of the former theory the father had no immediate connection with his own child: he could not bestow upon it a particle of his corporeal frame, and the entire production was the operation of the mother. In consequence, then, of this discovery, we were instructed that the whole creation was the property of the father, and that the mother, in her turn, had nothing to do with it; that every particle of the projected fluid was a true and perfect semen, containing in itself, like the ovum of the female upon the theory of Harvey, the miniature of all the organs and members of the future fetus, which in due time were gradually evolved and augmented; and that the uterus and ovum, into which some one of these semina was almost sure of being protruded in the act of coition, conjointly offered nothing more than a mere nest, in which the homunculus, or radimental fetus, was deposited for warmth and nutriment. And as the former appealed to the phenomena of oviparous animals during the period of incubation, the phenomena of worms and porwigles were appealed to by the latter; and a very considerable degree of life and motion were supposed to be incontrovertibly discovered, by the aid of good magnifying glasses, in the seminal fluid itself, and not less than many millions of these homunculi, or little unborn men, frisking about in a diameter of the smallest grain of sand, and all of them of the exact shape of a tadpole. But Delappius, a pupil of Leewenhoek, advanced farther, for he not only saw these tadpoles but traced one of them bursting through its tunic and exhibiting two arms, two legs, the human head and heart. Imagination, we see, is not confined to poetry: it often extends as largely to the profoundest branches of science; and the investigator of philosophical systems meets with his occasional pleasantries, as well as the hunter after historical anecdotes. It is truly astonishing, however, to reflect on the universality with which this latter opinion has, till within a very few years, been accredited; and how decisively every anatomist, and indeed every man who pretended to the smallest portion of medical science, was convinced that his children were no more related, in point of actual generation, to his own wife than they were to his neighbours! It was in vain that Verheyen denied the existence of animalcules in the seminal fluid, and demonstrated that the motion supposed to be traced there was a mere microscopic delusion: it was in vain that the impossibility was urged of the descent of a pulpy and vesicular ovulum through the almost imperceptible canal of the Fallopian tube, with which, in reality, it is never immediately connected; it was in vain to adduce the existence of an equal quantity of maternal and paternal features in almost every family in the world, the undeviating intermixture of features in mules and other hybrid animals, and the casual transfer of maternal impressions to the child when suddenly frightened during the earlier period of gestation. The system of generation *ab animalculo maris* was still triumphantly maintained, and the feeble exertions of the few who had sense enough to oppose it was drowned in the multitudinous vociferation of their opponents.

"At last arose the accurate and indefatigable Buffon, and undecoyed by opinion, as well as undismayed by clamour, he resolved to deviate from the beaten path of absurdity, to think for himself, and to publish his thoughts to the world. And what do they at last amount to? —A resuscitation of the Epicurean theory of Lucretius, illustrated and explained from modern science and the experience of additional ages. All animals and vegetables, according to the ingenious theory of this admirable naturalist, contain an infinite number of organic molecules in every part of their frames; but in the sexual fluid and the seed-vessels of plants they are more numerous than in any other parts. These organic elements afford nutrition and growth to the animal and vegetable system; and when either becomes adult, the surplus is secreted and strained off for the formation of their respective seeds. The existence of vesicular ova detached at distinct periods of time from the female ovarium is, upon this hypothesis, a mere chimera, and their passage through the Fallopian tube into the uterus is declared to be totally unfounded on any proof whatsoever, and a mere assumption for the purpose of systematizing. The ovaria are, in reality, testes, receiving, like those of the male, the surplus of the organic molecules of the body, and secreting them for the purpose of generation. The seminal liquor thus secerned in the male and female frames are, in the act of coition, protruded at the same time into the uterus; and becoming intimately blended together, produce by a kind of new fermentation the first filaments of the fetus, which grow and expand like the filaments of plants; for nature, it appears, commences all her operations by a similar kind of motion; and the fetus, in its state of incipient existence, possesses nothing more than this. To render such combination of seminal fluids productive, it is contended that their quantities must be duly proportioned, their powers of action definite, and their solidity, tenacity, or rarefaction symphoneous and accordant; and that the fetus is either male or female as the animal fluid of the man or woman abounds most with organic molecules, and resembles the father or the mother according to the different combinations of these elements.

"This ingenious theory has since been strenuously supported by Maupertius in his Venus Physique, and Needham in his admirable paper inserted in the Philosophical Transactions, vol. xiv. In each of these last publications, indeed, we find some degree of change, and for the most part some degree of improvement; but the variations are neither numerous nor very essential. The system of Darwin differs but little from that of Buffon, and obviously took its rise from it. Professor Blumenbach, of

Gottingen, has also of late brought forwards a theory not essentially different from this of Dr. Darwin."

We have only to add that the theory of epigenesis, first started by the Epicureans, and since re-started by Buffon, has also received complete or nearly complete confirmation both in zoology and phytology by the experiments of Spalanzani and Koelreuter, and the result of such experiments as applied by Werner.

GENERATION (Female organs of). The parts subservient to generation in a woman are divided into external and internal. The external parts are the mons veneris, the labia, the perinæum, the clitoris, and the nymphæ. To these may be added the meatus urinarius, or orifice of the urethra. The hymen may be esteemed the barrier between the external and internal parts. That soft fatty prominence which is situated upon the ossa pubis, extending towards the groins and abdomen, is called the mons veneris; its use seems to be chiefly that of preventing inconvenience or injury in the act of coition. If a line be drawn across the anterior angle of the pudendum, all that part above it which is covered with hair may be called mons veneris, below it the labia commence, which being of a similar though looser texture, appear like a continuance of the mons veneris passing on each side of the pudendum, which they chiefly compose. Proceeding downwards and backwards the labia again unite, and the perinæum is formed. All that space between the posterior angle of the pudendum and the anus is called the perinæum; the external covering of which is the skin, as the vagina is the internal; including between them cellular and adipose membrane and the lower part of the sphincter ani. The extent of the perinæum is generally about an inch and a half, though in some subjects it is not more than one, and in others is equal to three inches. The thin anterior edge is called the frænum labiorum. Below the anterior angle of the pudendum the clitoris is placed, which arises by two crura or branches from the upper part of the rami of the ischia. The external part or extremity of the clitoris is called the glands, which has a prepuce or thin covering to which the nymphæ are joined. The clitoris is supposed to be the principal seat of pleasure, and to be capable of some degree of erection in the act of coition. The nymphæ are two small spongy bodies or doublings of the skin, rising from the extremities of the prepuce of the clitoris, less in size, but resembling in their form the labia. They pass on each side of the pudendum within the labia to half its length, when they are gradually diminished till they disappear. Immediately below the inferior edge of the symphysis of the ossa pubis, between the nymphæ, is the [illegible] or termination of the urethra, which is [illegible] inch and a half in length, [illegible] in a straight [illegible] symphy- [illegible] connected [illegible] of the [illegible] a mucus for the purpose of preserving the external part from any injury, to which they might be liable from the acrimony of the urine. There is a very great difference in the appearance of all these parts in different women, especially in those who have had many children, and at various periods of life. In young women they are firm and vegete, but in the old, these, together with the internal, become flaccid and withered. The labia and nymphæ are liable to elongation, to excrescences, and to the production of schirrous tumours, which in some instances have grown to an enormous size, especially in hot climates. It is not unusual for one of the labia or of the nymphæ to be larger or more pendulous than the other: but the enlargement or elongation are not regarded as diseases, till some inconvenience is produced by them. The internal parts of generation are the vagina and uterus and its appendages. See VAGINA, UTERUS, &c.

GENERATION (Male organs of). The parts which constitute the organs of generation in men are the PENIS, TESTICLES, and VESICULÆ SEMINALES. For which, see these respective articles.

GENERATING LINE or FIGURE, in geometry, is that which by its motion produces any other plane or solid figure. Thus a right line moved any way parallel to itself, generates a parallelogram; round a point in the same plane, with one end fastened in that point, it generates a circle. One entire revolution of a circle, in the same plane, generates the cycloid; and the revolution of a semicircle round its diameter, generates a sphere.

GE'NERATIVE. *a.* (*generatif*, French.) 1. Having the power of propagation (*Brown*). 2. Prolific; having the power of production; fruitful (*Bentley*).

GENERA'TOR. *s.* (from *genero*, Lat.) The power which begets, causes, or produces (*Br.*).

GENERATOR, in music, signifies the principal sound or sounds by which others are produced. Thus the lowest C for the treble of the harpsichord, besides its octave, will strike an attentive ear with its twelfth above, or G in alt, and with its seventeenth above, or E in alt. The C, therefore, is called their generator, the G and E its products or harmonics. But in the approximation of chords, for G its octave below is substituted, which constitutes a fifth from the generator or lowest C; and for E is likewise substituted its fifteenth below, which, with the abovementioned C, forms a third major. To the lowest notes, therefore, exchanged for these in alt by substitution, the denominations of products or harmonics are likewise given, whilst the C retains the name of their generator. But still, according to the system of Tartini, two notes in concord, which when sounded produce a third, may be termed the concurring generators of that third.

As the famous discovery of Tartini is far from universally known, although it has led to the adoption of some new and ingenious principles in the theory of music, a brief account of it is here laid before the reader.

"If two sounds be produced at the same time properly tuned and with due force, from their conjunction a third sound is generated, so much more distinctly to be perceived by delicate ears as the relation between the generating sounds is more simple; yet from this rule we must except the unison and octave. From the fifth is produced a sound unison with its lowest generator; from the fourth, one which is an octave lower than the highest of its generators; from the third major, one which is an octave lower than its lowest; and from the sixth minor (whose highest note forms an octave with the lowest of the third formerly mentioned) will be produced a sound lower by a double octave than the highest of the lesser sixth; from the third minor, one which is double the distance of a greater third from its lowest; but from the sixth major (whose highest note makes an octave to the lowest in the third minor), will be produced a sound only lower by double the quantity of a greater third than the highest; from the second major, a sound lower by a double octave than the lowest; from a second minor, a sound lower by triple the quantity of a third major than the highest; from the interval of a diatonic or greater semitone, a sound lower by a triple octave than the highest; from that of a minor or chromatic semitone, a sound lower by the quantity of a fifth four times multiplied than the lowest, &c. &c. But that these musical phenomena may be tried by experiments proper to ascertain them, two hautboys tuned with scrupulous exactness must be procured, whilst the musicians are placed at the distance of some paces one from the other, and the hearers in the middle. The violin will likewise give the same chords, but they will be less distinctly perceived, and the experiment more fallacious, because the vibrations of other strings may be supposed to enter into it."

GENE'RIC. Gene'rical. *a.* (*generique*, French.) That comprehends the genus, or distinguishes from another genus (*Watts*).

Generic character, in botany, or zoology, the definition of the genus of a plant or animal. This is factitious, essential, or natural. See Genus and Character.

Generic name. Cognomen gentilitium. In botany, the family surname, as it were, of vegetables.

GENE'RICALLY. *ad.* With regard to the genus, though not the species (*Woodward*).

GENERO'SITY. *s.* (*generosité*, French.) The quality of being generous; magnanimity; liberality (*Locke*).

Generosity, the disposition which prompts us to bestow favours, which are not the purchase of any particular merit. It has not, like mercy, any immediate relation either to imprudencies or criminality. It is compounded of benevolence with a degree of sympathy with some peculiarities in the state or circumstances of another, which demand our aid; either in the remission of pecuniary claims, in voluntary grants, or in donations and benefactions to assist their indigence. It generally relates to some concessions, sacrifices, or peculiar exertions that have been made in the exercise of the benevolent principle. The extent of generosity is measured by the advantages and pleasures which have been relinquished in favour of another; or according to the troubles and difficulties which have been encountered by the benefactor on the one hand, and the slender pretensions of the object to these benevolent offices on the other. (*Cogan on the Passions*).

GE'NEROUS. *a.* (*generosus*, Latin.) 1. Not of mean birth; of good extraction. 2. Noble of mind; magnanimous; open of heart (*Pope*). 3. Sprightly; daring; courageous (*Cowley*). 4. Liberal; munificent (*Parnel*). 5. Strong; vigorous (*Boyle*).

GE'NEROUSLY. *ad.* (from *generous*.) 1. Not meanly with regard to birth. 2. Magnanimously; nobly (*Dryden*). 3. Liberally, munificently.

GE'NEROUSNESS. *s.* (from *generous*.) The quality of being generous (*Collier*).

GENESIS, the first book of the Old Testament, containing the history of the creation and the lives of the first patriarchs. The book of Genesis stands at the head of the Pentateuch. Its author is held to be Moses; it contains the relation of 2369 years, viz. from the beginning of the world to the death of Joseph. The Jews are forbidden to read the beginning of Genesis and the beginning of Ezekiel before 30 years of age. The Hebrews called this book Bereschith, because it begins with that word, which in their language signifies *in principio*, or "in the beginning." The Greeks gave it the name Genesis, Γενεσις, q. d. production, generation, because it begins with the history of the production or generation of all beings. This book, besides the history of the creation, contains an account of the original innocence and fall of man; the propagation of mankind; the rise of religion; the general defection and corruption of the world; the deluge; the restoration of the world; the division and peopling of the earth; and the history of the first patriarchs to the death of Joseph. It was easy for Moses to be satisfied of the truth of what he delivers in this book, because it came down to him through a few hands: for from Adam to Noah there was one man, viz. Methuselah, who lived so long as to see them both: in like manner Shem conversed with Noah and Abraham; Isaac with Abraham and Joseph, from whom the records of this book might easily be conveyed to Moses by Amram, who was contemporary with Joseph.

Genesis, in geometry, denotes the formation of a line, plane, or solid, by the motion or flux of a point, line, or surface. (See Fluxions.) The genesis or formation, e. gr. of a globe or sphere is conceived by supposing a semicircle to revolve upon a right line, drawn from one extreme thereof to the other, called its axis, or axis of circumvolution; the motion or revolution of that semicircle is the genesis of the sphere, &c. In the genesis of figures, &c.

the line or surface that moves is called the describent; and the line round which, or according to which, the revolution or motion is made, the dirigent.

GENET, in mastiology. See VIVERRA.

GENETHLIACI, in astrology, persons who erect horoscopes, or pretend to foretel what shall befal a man, by means of the stars which presided at his nativity. The word is formed of the Greek γενεθλη, origin, generation, nativity.

GENETHLIACUM, GENETHLIAC POEM, is a composition in verse, on the birth of some prince, or other illustrious person; wherein the poet promises him great honours, advantages, &c.

GENETHLI'ACS. *s.* (from γενεθλη.) The science of calculating nativities, or predicting the future events of life from the stars predominant at the birth.

GENETTE, in the old manage, a Turkish bit, the curb of which is all of one piece, made like a large ring, and placed above the liberty of the tongue. When they bridled a horse, they made his chin pass through this curb, which surrounds his beard. This sort of bit was much used at the court of France when Guillet wrote.

GENETTE, is also used for a particular way of riding practised in Spain: this, being so short that the spurs bear upon the horse's flank, would be reckoned absurd in England; but, among the Spaniards, it is thought handsome, when they ride upon their genettes before the ladies in going to court.

GENEVA, an ancient, large, and populous town, capital of a republic of the same name, near the confines of France and Swisserland. It is seated on the most narrow part of the lake of the same name, where the Rhone issues in two large narrow channels, which soon after unite. This river divides the city into two unequal parts. Geneva, which lies partly in the plain on the borders of the lake, and partly on a gentle ascent, is irregularly built. It is the most populous town of Swisserland, containing 24,000 souls. The reformation, first preached at Geneva, by William Farel, a native of Gap, and Peter Viret, of Orbe, owed its final reception and establishment here to the celebrated John Calvin. The treaty of alliance which Geneva contracted with Bern and Friburg, in 1526, may be considered as the true era of its liberty and independence; for, not long after, the dukes of Savoy were deprived of the authority which they possessed over this city, the bishop was expelled, a republican form of government established, and the reformation intruduced. In 1584, Geneva concluded a treaty of perpetual alliance with Zurich and Bern, by which it is allied with the Swiss cantons. It is governed by a senate, or little council of 25; of which four are annually chosen syndics, who are the chief magistrates. Thus far [illegible] But [illegible] general [illegible] senate does the other half. This is the democratic part of the government. The houses of Geneva are lofty, and many that stand in the trading part of the city have arcades of wood, which are raised even to the upper stories. These arcades, supported by pillars, give a gloomy appearance to the street, but are useful to the inhabitants in protecting them from the sun and rain. The citizens of both sexes are remarkably well instructed. Lat. 46. 11 N. Lon. 6. 5 E.

GENEVA (Lake of), a large lake between Swisserland and Savoy, in a valley, which separates the Alps from Mount Jura. The length along the coast of Swisserland is eighteen leagues and three quarters (twenty-five to a degree), on the side of Savoy fifteen leagues: the greatest breadth three leagues and a quarter. The water is clear, except where the entrance of the Rhone makes it foul by the quantity of mud it brings along with it in its course: near Geneva it is shallow, but in some parts exceedingly deep, by some said to be unfathomable: it abounds in fish remarkable as well for their excellence as size.

GENEVA. Gin. A hot, fiery spirit, too much used by the lower classes of people in this country as a dram, and is unquestionably most injurious to their constitution and morals. A liquid of this kind was formerly sold in the apothecaries shops, drawn from the juniper-berry, but distillers now have completely supplanted the trade of the apothecary, who sell it under the name of geneva, or gin, in which, it is believed, juniper-berries make no part of the composition. It is composed of oil of turpentine and malt spirits. A better sort is said to be drawn off by a slow fire, from juniper-berries, proof-spirits, and water in the proportion of three pounds of berries to four gallons of water and ten of spirit. The celebrated Hollands geneva is manufactured chiefly at a village near Rotterdam, from the same materials, making use of French brandy instead of malt spirits.

GENEVIEVE, a town of North America, on the west side of the Missisippi. Lat. 37. 35 N. Lon. 90. 44 W.

GENEVIEVE, St. GENEVIEVE, or St. GENEVIEFVE, fathers or religious of St. Genevieve, the name of a congregation of regular canons of the order of St. Augustin, established in France. The congregation of St. Genevieve is a reform of the Augustine canons. It was begun by St. Charles Faure, in the abbey of St. Vincent de Senlis, whereof he was a member, in the year 1618. The congregation takes its name from the abbey of St. Genevieve, which is the chief of the order, and whose abbot is the general thereof. The abbey itself took its name from St. Genevieve, the patroness of the city of Paris, who died in the year 512. Five years after her death, Clovis erected the church of St. Genevieve, under the name and invocation of St. Peter, where her relics are still preserved, her shrine visited, and her image carried with great processions and ceremonies upon extraordinary occasions, as when some great favour is to be intreated of heaven,

GENIAL, GENIALES, an epithet given by the pagans to certain gods who were supposed to preside over generation.

GE'NIAL. *a.* (*genialis*, Latin.) 1. That contributes to propagation (*Dryden*). 2. That gives cheerfulness, or supports life (*Milton*). 3. Natural; native (*Brown*).

GE'NIALLY. *ad.* 1. By genius; naturally (*Glanville*). 2. Gaily; cheerfully.

GENICULATE. In botany. Kneed. (Knee-jointed, *With.*) Applied to a stem, peduncle or awn, forming a very obtuse angle at the joints, as when the knee is a little bent. As in alopecurus geniculatus. In Delin. Pl. it is explained to be, internodiis interceptus, which is the same with nodosus. There is this difference, however, that nodous (*nodosus*) means knotty, or merely having knots; whereas geniculate implies, that the stem is bent in an angle at the joint. Flexuous is totally different from both, for it implies deviation in a curve, not at an angle. See KNOTTED.

GENICULE. (dimin. from *Genu.*) In botany. Knee, knot, or joint. Properly a joint, where there is a bending, like that at the knee: but is frequently put for a joint in general; and then is synonymous with nodus. See KNOT and KNOTTED.

GENICULA'TION. *s.* (*geniculatio*, Lat.) Knottiness.

GENII, a sort of intermediate beings, which the Mahometans believe to exist between men and angels: of a grosser fabric than the latter, but much more active and powerful than the former. Some of them are good, others bad; and they are thought capable of future salvation and damnation, like men.

GE'NIO. *s.* (*genio*, Ital. *genius*, Latin.) A man of a particular turn of mind (*Tatler*).

GENIO. (from γενειον, the chin.) In anatomy, names compounded of this word belong to muscles which are attached to the chin.

GENIO-HYO-GLOSSUS. (*musculus genio-hyo-glossus*, γενειοϋογλωσσος; from γενειον, the chin, and γλωσσα, the tongue, so called from its origin in the chin, and insertion in the tongue.) This muscle forms the fourth layer between the lower jaw and os hyoides. It arises from a rough protuberance in the inside of the middle of the lower jaw; its fibres run like a fan, forwards, upwards, and backwards, and are inserted into the top, middle, and root of the tongue, and base of the os hyoides, near its cornu. Its use is to draw the tip of the tongue backwards into the mouth, the middle downwards, and to render its back concave. It also draws its root and the os hyoides forwards, and thrusts the tongue out of the mouth.

GENIO-HYOIDEUS. (*musculus, genio-hyoideus*, γενειοϋοειδαιος; from γενειον, the chin, and ϋοειδης, the os hyoides, so called from its origin in the chin, and its insertion in the os hyoides.) This muscle constitutes the third layer between the lower jaw and os hyoides. It is a long, thin, and fleshy muscle, arising tendinous from a rough protuberance at the inside of the chin, and growing somewhat broader and thicker as it descends backward to be inserted by very short tendinous fibres into both the edges of the base of the os hyoides. It draws the os hyoides forwards to the chin.

GENIOSTOMA, in botany, a genus of the class pentandria, order monogynia. Corol funnel-form, the throat bearded; calyx inferior, five-cleft; stigma cylindrical, grooved; capsule two-celled, many seeded. One species; a native of Tama island.

GENIPI ALBUM. The plant which bears this name in the pharmacopœias is the Artimisia rupestris; foliis pinnatis, caulibus adscendentibus; floribus globosis, cernuis; receptaculo papposo, of Linnéus. It has a grateful smell, and is used in some countries in the cure of intermittents and obstructed catamenia. See ARTEMISIA.

GENIPI VERUM. The plant directed for medicinal purposes under this title is the Achillea; foliis, pinnatis, pinnis simplicibus, glabris, punctalis of Haller. It has a very grateful smell, and a very bitter taste, and is exhibited in Switzerland in epilepsy, diarrhæa, and debility of the stomach. See ACHILLEA.

GENISTA. Green-weed. In botany, a genus of the class diadelphia, order decandria. Calyx two-lipped, with two short teeth above and three longer beneath; banner oblong, reflected back by the pistils and stamens. Twenty-five species; almost all of them natives of Europe, generally of the south of Europe; three only common to our own heaths. Of this genus a few are spinous, but by far the greater number unarmed. Those indigenous amongst ourselves are:

1. G. tinctoria: with leaves lanceolate, glabrous; branches round, striate, erect; legumes glabrous. It is found both on our heaths and in our pastures with a shrubby stalk about three feet high. The flowers are used by dyers for giving a yellow colour to their materials, whence the plant has obtained the name of dyer's weed, or dyer's broom. Horses and cattle of all kinds eat it. See the article DYEING.

2. G. pilosa. Leaves lanceolate, fascicled; silky underneath, peduncles axillary very short; corols hairy: stem tubercled, striate, procumbent. Found on dry heaths; and not disliked by cattle.

3. G. anglicana; with simple or compound spines, flowering branches unarmed; leaves oblong, glabrous; racemes leafy; corols glabrous. Found in large quantities on almost every heath; and too common to require farther notice. Horses and cattle refuse it; goats, however, eat it readily.

GENISTA CANARIENSIS. The systematic name of the tree whose wood is called rhodium. See RHODIUM LIGNUM.

GE'NITALS. *s.* (*genitalis*, Lat.) Parts belonging to generation (*Brown*).

GE'NITING. *s.* (A corruption of *Janeton*, French.) An early apple. See PYRUS.

GENITIVE, in grammar, the second case of the declensions of nouns.

The relation of one thing considered as belonging in some manner to another, has occasioned a peculiar termination of nouns, called the genitive case.

In English, the genitive case is made by prefixing the particle *of*; in French, *de*, or *du*, &c. though, in strictness, there are no cases at all, or at most only two, in either of those languages, inasmuch as they do not express the different relation of things by different terminations, but only by additional prepositions. (See CASE.) In the Latin, this relation is expressed in divers manners: thus we say, *caput hominis*, the head of a man; *color rosæ*, the colour of a rose; *opus Dei*, the work of God, &c.

GENITUM, in mathematics, a name given by sir Isaac Newton, in his Principia, to any quantity which is not made by addition, or subduction of divers parts, but is generated or produced, in arithmetic, by the multiplication, division, or extraction of roots, of any terms whatsoever, in geometry, by the invention of contents, and sides, or of the extremes and mean proportionals. "Quantities of these sorts (says he) I consider as variable and indetermined, and increasing or decreasing, as it were, by a perpetual motion, or flux; and I understand their momentaneous increments, or decrements, by the name of moments. Se FLUXIONS.

GE'NIUS. *s.* 1. The protecting or ruling power of men, places, or things (*Milton*). 2. A man endowed with superior faculties (*Addison*). 3. Mental power or faculties (*Waller*). 4. Disposition of nature by which any one is qualified for some peculiar employment (*Pope*). 5. Nature; disposition (*Burnet*).

GENIUS, a good or evil spirit or dæmon, whom the ancients supposed set over each person, to direct his birth, accompany him in life, and to be his guard. (See DÆMON.) Among the Romans, Festus observes, the name *genius* was given to the God who had the power of doing all things, *deum qui vim obtineret rerum omnium gerendarum*; which Vossius, *de Idol.* rather chooses to read *genendarum*, who has the power of producing all things, by reason Censorinus frequently uses *gerere* for *gignere*. Accordingly St. Augustin, *de Civitat Dei*, relates, from Varro, that the genius was a god who had the power of generating all things, and presided over them when produced. Festus adds, that Aufustius spake of the genius as the son of God; and the father of men, who gave them life. Others, however, represented the genius as the peculiar or tutelary god of each place; and it is certain the last is the most usual meaning of the word. The ancients had their genii of nations, of cities, of provinces, &c. Nothing is more common than the following inscription on medals; GENIUS POPULI ROM. "the genius of the Roman people;" or GENIO POP. ROM. "to the genius of the Roman people;" In this sense genius and lar were the same thing; as, in effect, Censorinus and Apulius affirm, they were. See LARES and PENATES.

The Platonists and other eastern philosophers supposed the genii to inhabit the vast region or extent of air between earth and heaven. They were a sort of intermediate powers, who performed the office of mediators between gods and men. They were the interpreters and agents of the gods, communicated the will of the deities to men, and the prayers and vows of men to the gods. As it was unbecoming the majesty of the gods to enter into such trifling concerns, this became the lot of the genii, whose nature was a mean between the two, who derived immortality from the one and passions from the other, and who had a body framed of an aërial matter. Most of the philosophers, however, held that the genii of particular men were born with them, and died; and Plutarch attributes the ceasing of oracles partly to the death of the genii. See ORACLE.

GENIUS, in matters of literature, &c. a natural talent or disposition to do one thing more than another, or the aptitude a man has received from the God of nature to perform well and easily that which others can do but indifferently and with a great deal of pains. The distinguishing characteristic of genius is invention. A man of genius is fertile in the production of new trains of thought, new selections and groupings of imagery, new expedients for the removal of difficulties, &c. Thus genius may be termed the power of making new combinations, pleasing or elevating to the mind, or useful to mankind. To know the bent of nature is of great importance. Men usually come into the world with a genius determined not only to a certain art or science, but often to certain parts of it, in which alone they are capable of success. If they quit their sphere, they fall even below mediocrity in their profession. Art and industry add much to natural endowments, but cannot supply them where they are wanting. Every thing depends on genius. A painter often pleases without observing rules, whilst another displeases though he observes them, because he has not the happiness of being born with a genius for painting.

A man born with a genius for commanding an army, and capable of becoming a great general by the help of experience, is one whose organical conformation is such, that his valour is no obstruction to his presence of mind, and his presence of mind causes no abatement of his valour. Such a disposition of mind cannot be acquired by art: it can be possessed only by a person who has brought it with him into the world. What has been said of these two arts may be equally applied to all other professions. The administration of great concerns, the art of putting people to those employments for which they are naturally formed, the study of physic, and even gaming itself, all require a genius. Nature has thought fit to make a distribution of her talents among men, in order to render them necessary to one another, the wants of men being the very first link of society; she has therefore pitched upon particular persons, to give them aptitude to perform rightly some things which she has rendered impossible to others; and the latter have a greater facility granted them for other things, which

facility has been refused to the former. Nature, indeed, has made an unequal distribution of her blessings among her children; yet she has disinherited none; and a man divested of all kinds of abilities is as great a phenomenon as an universal genius.

From the diversity of genius the difference of inclination arises in men, whom Nature has had the precaution of leading to the employments for which she designs them, with more or less impetuosity in proportion to the greater or less number of obstacles they have to surmount in order to render themselves capable of answering this vocation. Thus the inclinations of men are so very different, because they follow the same mover, that is, the impulse of their genius. This, as with the painter, is what renders one poet pleasing even when he trespasses against rules, while others are disagreeable, notwithstanding their strict regularity.

The genius of these arts, according to the abbé du Bos, consists in a happy arrangement of the organs of the brain; in a just conformation of each of these organs; as also in the quality of the blood, which disposes it to ferment, during exercise, so as to furnish plenty of spirits to the springs employed in the functions of the imagination. Here he supposes that the composer's blood is heated, for that painters and poets cannot invent in cool blood; nay, that it is evident they must be wrapt into a kind of enthusiasm when they produce their ideas. Aristotle mentions a poet who never wrote so well as when his poetic fury hurried him into a kind of phrensy. The admirable pictures we have in Tasso of Armida and Clorinda were drawn at the expence of a disposition he had to real madness, into which he fell before he died. "Do you imagine (says Cicero), that Pacuvius wrote in cold blood? No, it was impossible. He must have been inspired with a kind of fury, to be able to write such admirable verses."

We by no means wish it to be understood, from any thing said above, that genius is independent of method, or derives no aid from it. On the contrary we are persuaded that the man of philosophical genius pursues his investigations, the poet courts his muse, the painter sits down to his canvas, the inventive mechanist turns to his instruments, each by some method peculiar to himself; each following some rule, which though he is most probably incapable of imparting or even of explaining to another, he nevertheless invariably conforms to. The following remarks which a truly philosophical artist has applied to painting, may be extended, with some trifling alterations, to all the different employments of our intellectual powers.

"What we now call genius, begins, not where rules abstractedly taken end, but where known, vulgar, and trite rules have no longer any place. It must of necessity be, that works of genius, as well as every other effect, as they must have their cause, must likewise have their rules; it cannot be by chance that excellencies are produced with any constancy, or any certainty, for this is not the nature of chance; but the rules by which men of extraordinary parts, and such as are called men of genius, work, are either such as they discover by their own peculiar observation, or of such a nice texture as not easily to admit handling or expressing in words.

"Unsubstantial, however, as these rules may seem, and difficult as it may be to convey them in writing, they are still seen and felt in the mind of the artist; and he works from them with as much certainty as if they were embodied, as I may say, upon paper. It is true, these refined principles cannot be always made palpable like the more refined rules of art; yet it does not follow, but that the mind may be put in such a train, that it shall perceive, by a kind of scientific sense, that propriety which words can but very feebly suggest." (*Sir Joshua Reynolds's Discourses*).

GENOA, a republican state of Italy; bounded on the north by Piedmont, the Milanese, and the Parmesan, on the east by the states of the duke of Tuscany, on the south by the Mediterranean sea, and on the west by the county of Nice; about 120 miles in length, but scarcely in any part more than twenty in breadth. The country is mountainous, and part of it covered with barren rocks, which serve for its defence. Some of the mountains are covered with wood, and some yield good pasture. There is but a small quantity of arable land, so that the inhabitants are obliged to purchase great part of their corn from Naples, Sicily, and other places; however, they carefully cultivate every place they can, and throughout the year they are supplied with excellent legumes and vegetables for the table. They make a considerable quantity of wine, and have abundance of excellent fruit.

GENOA, a city of Italy, capital of a republic of the same name. It is about ten miles about, and defended towards the land by a double wall. Several bastions are erected along the sea shore, on rocks which rise above the water. The streets are in general narrow, but clean and well paved; two, called the Strada Nuova and Strada Balbi, are filled with magnificent palaces, fronted with marble. It is the see of an archbishop. The cathedral is built in the Gothic style, and paved with black and white marble, in the treasury of which is preserved a curious hexagon dish, said to be of a single emerald, found at Cesarea in the time of the crusades, which the Genoese received as their share of the plunder. Besides the cathedral, it contains thirty-two parish churches, many of which are magnificent, and adorned with sculptures and pictures by the best masters. The doge's palace is large, without decoration, except two statues of John Andrew Doria and Andrew Doria, larger than the life, at the entrance. The arsenal contains arms for 34,000 men, machines, models for bridges, the armour worn by a number of Genoese women in the crusades, a shield containing [illegible], made by Julius Cesar Vacche, for the purpose of as-

sassinating the doge and senate at one time, &c. Other public buildings are the Albergo, which serves as a poor-house and house of correction, where is a beautiful relievo, the Virgin supporting a dead Christ, by Michael Angelo; and the assumption of the Virgin, in white marble, by Puget, an inimitable piece of sculpture; a large hospital for the sick of all nations and religions; the Conservatory, for educating and portioning 300 poor girls; and a great number of palaces belonging to the nobility. They reckon at Genoa sixty-nine convents of men and women. The number of inhabitants is estimated at 150,000. Lat. 44. 25 N. Lon. 8. 41 E.

The government of Genoa was aristocratic, none but the nobility having any share in it. These were of two sorts, the old and the new, whence there were eighty persons chosen, who made the great council, in which their sovereignty resided. Besides these, there was a senate, composed of the doge and twelve senators, who had the administration of affairs. The doge continued in his office but two years. In the year 1798, the French contrived, by intrigues and force, entirely to change the old government, and to erect the Genoese territory into what they called the Ligurian republic, governed after the manner of their own, by two councils and a directory: the country likewise was divided into departments. At present Genoa is subject to the dominion of a son-in-law of Bonaparte, who has assumed the title of king of Italy.

GENSENG, in botany. See PANAX.

GENT. *a.* (*gent*, old French.) Elegant; soft; gentle; polite: not in use (*Spenser*).

GENTE'EL. *a.* (*gentel*, Fr.) 1. Polite; elegant in behaviour; civil (*Addison*). 2. Graceful in mien (*Tatler*). 3 Elegantly dressed (*Law*).

GENTE'ELNESS. *s.* (from *genteel.*) 1. Elegance; gracefulness; politeness (*Dryden*). 2. Qualities befitting a man of rank.

GENTES, in botany, nations, great tribes, or rather casts of vegetables. Linnéus makes nine of them. 1. Palmæ. 2. Gramina, or grasses. 3. Lilio. 4. Herbæ. 5. Arbores, trees. 6. Filices, ferns. 7. Musci, mosses. 8. Algæ. 9. Fungi. The only difference between this arrangement and that of families is, that the third, fourth, and fifth divisions of the former are included in the seventh of the latter.

GENTIA'NA. Gentian. In botany, a genus of the class pentandria, order digynia. Corol one-petalled, tubular at the base, without nectariferous pores; capsule superior, two-valved, one-celled, many-seeded. Fifty-six species: which may be thus sub-arranged.

A. Corols from five to nine-cleft; somewhat campanulate.

B. Corols funnel-form, naked, five or ten-cleft.

C. Corols four or five-cleft, with capillary, many-cleft acute scales at the orifice.

D. Corols four or five-cleft, salver-shaped, with the orifice naked.

The different species are scattered over the globe, but the greater number are Alpine plants; and five indigenous to the pastures and mountains of our own country. Those of chief note are,

1. G. lutea. Corols about five-cleft, wheel-shaped, whorled; the whorls somewhat cymed; calyx spathaceous. It has a long, cylindric root, which affords the common gentian of the dispensatories. This root has little or no smell, but to the taste evinces great bitterness, on which account it is in general use as a tonic, stomachic, anthelmintic, antiseptic, emmenagogue, and febrifuge. The officinal preparations of this root are infusum gentianæ compositum of the London pharmacopœia, and infusum amarum, vinum amarum, tinctura amara of the Edinburgh pharmacopœia; together with an extract, for which a formula is given in both pharmacopœias. This plant is a native of the Alps, and some parts of Germany.

2. G. acaulis. Long-flowered gentian. Corol campanulate, five-cleft, as long as the stem; stem quadrangular. It is a native of the Alps, but frequently found in our flower-gardens, to the beauty of which it contributes in no small degree by its elegant and variable little azure flowers. See Nat. Hist. Plate CXXIII.

3. G. nivalis. Corols five-cleft, funnel-form; angles of the calyx equal, acute; branches alternate, one-flowered. It is found wild both in our own country and on the Alpine mountains.

The centaurium minus, or lesser centaury, is arranged by Linnéus and Hudson as a species of this genus: more minute examination, however, has since established it to be a monogynian rather than a digynian plant; and hence on the authority both of Withering, and Curtis, we have transferred it to the genus chironia. See CHIRONIA CENTAURIUM.

GENTIA'NA ALBA. The root of this plant, laserpitium latifolium; folius cordatis, inciso-serratis, of Linnéus, possesses stomachic, corroborant, and deobstruent virtues. It is seldom used. See LASERPITIUM.

GENTILE, GENTILIS, a pagan, or person who adores false gods. The Hebrews applied the name גוים, *gentes*, nations, to all the people of the earth who were not Israelites or Hebrews.

GENTILE, in the Roman law and history, a name which sometimes expresses what the Romans otherwise called barbarians, whether they were allies of Rome or not; but this word was used in a more particular sense for all strangers and foreigners not subject to the Roman empire.

GENTILESCHI (Horatio), an Italian painter, was born at Pisa in 1563. He painted in many cities of Italy, in France, and in England, with great repute. His finest work abroad was the portico of cardinal Bentivoglio's palace at Rome; and in England, the cielings at Greenwich and York-house. He died in this country at the age of eighty-four.

GENTILESCHI (Artemisia), daughter of the preceding, painted also with great success. Her picture of David with Goliah's head is deemed her best performance. She lived chiefly at Naples, in great splendour; and was famous for her amours.

GENTILE'SSE. *s.* (French.) Complaisance; civility: not used (*Hudibras*).

GE'NTILISM. *s.* (*gentilisme*, Fr.) Heathenism; paganism (*Stillingfleet*).

GENTILI'TIOUS. *a.* (*gentilitius*, Latin.) 1. Endemial; peculiar to a nation (*Brown*). 2. Hereditary; entailed on a family (*Arbuthnot*).

GENTI'LITY. *s.* (*gentilité*, French.) 1. Good extraction; dignity of birth. 2. Elegance of behaviour; gracefulness of mien; nicety of taste. 3. Gentry; the class of persons well born. 4. Paganism; heathenism (*Hooker*).

GE'NTLE. *a.* (*gentilis*, Latin.) 1. Well born; well descended; ancient, though not noble (*Sidney*). 2. Soft; bland; mild; tame; meek; peaceable (*Fairfax*). 3. Soothing; pacific (*Davies*).

GE'NTLE. *s.* 1. A gentleman; a man of birth (*Shakspeare*). 2. A particular kind of worm (*Walton*).

To GE'NTLE. *v. a.* To make gentle (*Shakspeare*).

GE'NTLEFOLK. *s.* (*gentle* and *folk*.) Persons distinguished by their birth from the vulgar.

GENTLE FLOWER, in botany. See AMARYLLIS.

GENTLES, in angling, the grubs or maggots of the musca vomitoria, or common flesh-fly or blow-fly, and of several other insects that feed on putrid animal food. They are a very common and useful bait in general fishing. In London they may be generally had of the tallow-chandlers fit for use, and should be kept in oatmeal and bran, as bran by itself is too dry. Where they cannot be thus obtained, the following, among other methods, may be an easy way of breeding and preserving them. Take a piece of beast's liver, and with a cross stick, hang it in some corner over a pot or barrel, half full of dry clay, and as the gentles grow big they will fall into the barrel and scour themselves, and be always ready for use whensoever you incline to fish; and may be thus created till after Michaelmas. But if you desire to keep gentles to fish with all the year, get a dead cat or kite, and let it be fly-blown, and when the gentles begin to be alive and to stir, bury it and them in soft moist earth, but as free from frost as you can, and these you may dig up at any time when you intend to use them; they will last till March, and about that time turn to flies.

GENTLEMAN, a person of good family, or descended of a family which has long borne arms, the grant of which adds gentility to a man's family.

The word is formed of the French *gentilhomme*, or rather of *gentil*, fine, fashionable, or becoming; and the Saxon man, q. d. *honestus*, or *honesto loco natus*: it probably comes originally from the Latin *gentilis homo*. The word is now applied indiscriminately to every man of an appearance and behaviour above the lower orders of the people.

Mr. Camden observes, that the distinction of a gentleman of coat-armour, or an upstart, and a gentleman of blood, is the bearing of arms from the grandfather; and that he who bears arms from his grandfather, is to all intents and purposes a gentleman of blood; for which cause it is requisite by the statutes of the Bath, that every knight before his admission, proves himself to be so qualified; which done it carries with it, if his merit be equal, a passport also to the order of the garter. Notitia Anglicana, p. 24. See also Doddridge's Honour's Pedigree, p. 147. Smith, De Republ. Angl. & Fortescue, fol. 82.

GENTLEMAN-USHER OF THE BLACK ROD, the chief gentleman-usher to the king: his duty is to bear the rod before the king at the feast of St. George at Windsor; and to his custody all peers questioned for any crime are first committed. His badge is a black rod, with a lion in gold at top.

GENTLEMEN OF THE BED-CHAMBER, persons of the first rank, ten in number; whose office is, each in his turn, to attend a week in the king's bed-chamber.

GENTLEMEN OF THE CHAPEL, officers whose duty and attendance is in the royal chapel, being in number thirty; ten whereof are priests, and the other twenty called clerks of the chapel, who assist in the performance of divine service.

GENTLEMEN PENSIONERS. See PENSIONER.

GENTLEMANLI'KE. GE'NTLEMANLY. *a.* (*gentleman* and *like*.) Becoming a man of birth (*Swift*).

GE'NTLENESS. *s.* (from *gentle*.) 1. Dignity of birth; goodness of extraction. 2. Softness of manners; sweetness of disposition; meekness (*Milton*). 3. Kindness; benevolence: obsolete (*Shakspeare*).

GE'NTLESHIP. *s.* Carriage of a gentleman.

GE'NTLEWOMAN. *s.* 1. A woman of birth above the vulgar; a woman well descended (*Bacon*). 2. A woman who waits about the person of one of high rank (*Shakspeare*). 3. A word of civility or irony (*Dryden*).

GE'NTLY. *ad.* (from *gentle*.) 1. Softly; meekly; tenderly; inoffensively; kindly (*Locke*). 2. Softly; without violence (*Grew*).

GE'NTRY. *s.* (*gentlery*, *gentry*, from *gentle*.) 1. Birth; condition (*Shakspeare*). 2. Class of people above the vulgar (*Sidney*). 3. A term of civility real or ironical (*Prior*). 4. Civility; complaisance: obsolete (*Shakspeare*).

GENTOOS, or GENTUS, in modern history, according to the common acceptation of the term, denote the professors of the religion of the bramins or brachmans, who inhabit the country called Hindustan, in the East Indies, from the word *stan*, a region, and *hind*

or hindu; which Ferishteh, as we learn from colonel Dow's translation of his history, supposes to have been a son of Ham the son of Noah.

The term Gentoo, or Gent, in the Sanscrit dialect, denotes animals in general, and in its more confined sense mankind, and is never appropriated particularly to such as follow the doctrines of Brhima. These are divided into four great tribes, each of which has its own separate appellation; but they have no common or collective term that comprehends the whole nation under the idea affixed by the Europeans to the word Gentoo.

The doctrine of transmigration is one of the distinguishing tenets of the Gentoos. With regard to this subject, it is their opinion, according to Mr. Holwell, that those souls which have attained to a certain degree of purity, either by the innocence of their manners or the severity of their mortifications, are removed to regions of happiness proportioned to their respective merits; but that those who cannot so far surmount the prevalence of bad example, and the powerful degeneracy of the times, as to deserve such a promotion, are condemned to undergo continual punishment in the animation of successive animal forms, until, at the stated period, another renovation of the four jogues shall commence, upon the dissolution of the present. They imagine six different spheres above this earth; the highest of which, called *suttee*, is the residence of Brhima and his particular favourites. This sphere is also the habitation of those men who never uttered a falsehood, and of those women who have voluntarily burned themselves with their husbands; the propriety of which practice is expressly enjoined in the code of the Gentoo laws. This code, printed by the East India Company in 1776, is a very curious collection of Hindoo jurisprudence, which was selected by the most experienced pundits or lawyers from curious originals in the Shanscrit language, who were employed for this purpose from May 1773 to February 1775; afterwards translated into the Persian idiom, and then into the English language by Mr. Halhed.

The several institutes contained in this collection are interwoven with the religion of the Gentoos, and revered as of the highest authority. The curious reader will discover an astonishing similarity between the institutes of this code and many of the ordinances of the Jewish law; between the character of the bramins or priests, and the Levites; and between the ceremony of the scape-goat under the Mosaic dispensation, and a Gentoo ceremony called the *ashummed jug*, in which a horse answers the purpose of the goat. Many obsolete customs and usages alluded to in many parts of the Old Testament may also receive illustration from the institutes of this code. It appears from the code, that the bramins, who are the priests and legislators of the country, have resigned all the secular and executive power into the hands of another cast or tribe; and no bramin has been properly capable of the magistracy since the time of the suttee jogue. The only privilege of importance which they have appropriated to themselves is an exemption from all capital punishment: they may be degraded, branded, imprisoned for life, or sent into perpetual exile; but it is every where expressly ordained, that a bramin shall not be put to death on any account whatsoever. See HINDUS.

GE'NU. (*genu*, *γονυ*, *παρα το εις γην νευειν*, because by it the body is bent towards the earth.) The knee.

GENUFLE'XION. *s.* (*genuflexion*, Fr.) The act of bending the knee; adoration expressed by bending the knee (*Stillingfleet*).

GE'NUINE. *a.* (*genuinus*, Lat.) Not spurious; real; natural; true (*Tillotson*).

GE'NUINELY. *ad.* Without adulteration; without foreign admixtures; naturally (*Boyle*).

GE'NUINENESS. *s.* (from *genuine*.) Freedom from any thing counterfeit; freedom from adulteration; purity; natural state (*Boyle*).

For the distinction between genuineness and authenticity, see AUTHENTICITY.

GENUS, among metaphysicians and logicians, denotes a number of beings which agree in certain general properties common to them all: so that a genus is nothing else but an abstract idea, expressed by some general name or term. See LOGIC and METAPHYSICS.

GENUS, the third division in a systematic arrangement of animals and vegetables; containing animals or plants of the same class and order, which agree in certain invariable parts of their structure, but disagree in others.

Genuses making an awkward plural, and genera not being English; it is perhaps to be often wished that we might be allowed to substitute *kind* for *genus*, and *sort* for *species*.

GENUS, in music, by the ancients called *genus melodiæ*, is a certain manner of dividing and subdividing the principles of melody; that is, the consonant and dissonant intervals into their concinuous parts. The moderns considering the octave as the most perfect of intervals, and that whereon all the concords depend in the present theory of music, the division of that interval is considered as containing the true division of the whole scale. But the ancients went to work somewhat differently: the diatessaron, or fourth, was the least interval which they admitted as concord; and therefore they sought first how that might be most conveniently divided; from whence they constituted the diapente and diapason. The diatessaron being thus, as it were, the root and foundation of the scale, what they called the *genera*, or kinds, arose from its various divisions; and hence they defined the *genus modulandi* to be the manner of dividing the tetrachord and disposing its four sounds as to succession. The genera of music were three, the enharmonic, chromatic, and diatonic. The two first were variously subdivided: and even the last, though that is commonly reckoned to be without any species, yet different authors have proposed different divisions under that

name, without giving any particular names to the species as was done to the other two. For the characters, &c. of these several genera, see ENHARMONIC, CHROMATIC, and DIATONIC.

GEOCENTRIC, is said of a planet or its orbit, to denote its having the earth for its centre. The moon alone is properly geocentric. And yet the motions of all the planets may be considered in respect of the earth, or as they appear from the earth's centre, and thence called their geocentric motions. Hence also the terms geocentric place, latitude, longitude, &c. being the place, latitude, longitude, &c. of a planet as seen from the earth's centre.

GEODÆ'SIA. *s.* (γεωδαισια.) That part of geometry which contains the doctrine or art of measuring surfaces, and finding the contents of all plane figures (*Harris*).

GEODÆ'TICAL. *a.* (from *geodæsia.*) Relating to the art of measuring surfaces.

GEOFFRÆ'A. (*Geoffræa*, named in honour of Dr. Geoffrey.) The bark so called is the produce of the Geoffroya inermis, of Swatz. Geoffroya inermis, foliolis lanceolatis. Class diadelphia. Order decandria. A native of Jamaica, where it is distinguished by the name of cabbage-bark tree, or worm-bark tree. It has a mucilaginous and sweetish taste, and a disagreeable smell. According to Dr. Wright of Jamaica, it is powerfully medicinal as an anthelmintic. See GEOFFROYA.

GEOFFRO'YA, in botany, a genus of the class diadelphia, order decandria. Calyx five-cleft; drupe ovate; not compressed. Three species; natives of South America and the West Indies: one well known as a tall, spinous tree, with axillary racemes: the other two unarmed, but trees also. Of these the bark of g. inermis, commonly distinguished by the name of bulgo-water tree, or bastard-cabbage tree, is used successfully in Jamaica as a vermifuge. It is given in the different forms of powder, decoction, syrup, and extract.

GEO'GRAPHER. *s.* (γη and γραφω.) One who describes the earth according to the position of its different parts (*Brown*).

GEOGRA'PHICAL. *a.* (*geographique*, Fr.) Relating to geography.

GEOGRA'PHICALLY. *ad.* In a geographical manner (*Broome*).

GEOGRAPHY, the science that teaches and explains the nature and properties of the earth, as to its figure, place, magnitude, motions, celestial appearances, &c. with the various lines, real or imaginary, on its surface.

Geography is distinguished from cosmography, as a part from the whole; this latter considering the whole visible world, both heaven and earth. And from topography and chorography, it is distinguished, as the whole from a part.

Golnitz considers geography as either exterior or interior: but Varenius more justly divides it into general and special; or universal and particular.

General or Universal Geography, is that which considers the earth in general, without any regard to particular countries, or the affections common to the whole globe: as its figure, magnitude, motion, land, sea, &c.

Special or Particular Geography, is that which contemplates the constitution of the several particular regions, or countries; their bounds, figure, climate, seasons, weather, inhabitants, arts, customs, language, &c.

History of Geography. The study and practice of Geography must have commenced at very early ages of the world. By the accounts we have remaining, it seems this science was in use among the Babylonians and Egyptians; from whom it passed to the Greeks first of any Europeans, and from these successively to the Romans, the Arabians, and the western nations of Europe. Herodotus says the Greeks first learned the pole, the gnomon, and the twelve divisions of the day, from the Babylonians. But Pliny and Diogenes Laertius assert, that Thales of Miletus, in the sixth century before Christ, first found out the passage of the sun from tropic to tropic, and it is said was the author of two books, the one on the tropic, and the other on the equinox; both probably determined by means of the gnomon; whence he was led to the discovery of the four seasons of the year, which are determined by the equinoxes and solstices; all which however it is likely he learned of the Egyptians, as well as his division of the year into 365 days. This it is said was invented by the second Mercury, surnamed Trismegistus, who, according to Eusebius, lived about 50 years after the Exodus. Pliny expressly says that this discovery was made by observing when the shadow returned to its marks; a clear proof that it was done by the gnomon. It is farther said that Thales constructed a globe, and represented the land and sea upon a table of brass. Farther that Anaximander, a disciple of Thales, first drew the figure of the earth upon a globe; and that Hecate, Democritus, Eudoxus, and others, formed geographical maps, and brought them into common use in Greece.

Timocharis and Aristillus, who began their observations about 295 B. C., it seems first attempted to fix the latitudes and longitudes of the fixed stars, by considering their distances from the equator, &c. One of their observations gave rise to the discovery of the precession of the equinoxes, which was first remarked by Hipparchus about 150 years after; who also made use of their method, for delineating the parallels of latitude and the meridians on the surface of the earth; thus laying the foundation of this science as it now appears.

The latitudes and longitudes, thus introduced by Hipparchus, were not however much attended to till Ptolemy's time. Strabo, Vitruvius, and Pliny, have all of them entered into a minute geographical description of the situation of places, according to the length of the shadows of the gnomon, without noticing the longitudes and latitudes.

Maps at first were little more than rude outlines, and topographical sketches of different countries. The earliest on record were those of Sesostris, mentioned by Eustathius; who says, that "this Egyptian king, having traversed great part of the earth, recorded his march in maps, and gave copies of them not only to the Egyptians, but to the Scythians, to their great astonishment." Some have imagined with much probability, that the Jews made a map of the Holy Land, when they gave the different portions to the nine tribes at Shiloh: for Joshua tells us that they were sent to walk through the land, and that they described

it in seven parts in a book; and Josephus relates that when Joshua sent out people from the different tribes to measure the land, he gave them, as companions, persons well skilled in geometry, who could not be mistaken in the truth.

The first Grecian map on record was that of Anaximander, mentioned by Strabo, lib. 1, p. 7, supposed to be the one referred to by Hipparchus under the designation of the ancient map. Herodotus minutely describes a map made by Aristagoras tyrant of Miletus, which will serve to give some idea of the maps of those times. He relates, that Aristagoras shewed it to Cleomenes king of Sparta, to induce him to attack the king of Persia at Susa, in order to restore the Ionians to their ancient liberty. It was traced upon brass or copper, and seems to have been a mere itinerary, containing the route through the intermediate countries which were to be traversed in that march, with the rivers Halys, the Euphrates, and Tigris, which Herodotus mentions as necessary to be crossed in that expedition. It contained one straight line called the Royal Road or Highway, which took in all the stations or places of encampment from Sardis to Susa; being 111 in the whole journey, and containing 13,500 stadia, or 1687½ Roman miles of 5000 feet each.

These itinerary maps of the place of encampment were indispensably necessary in all armies and marches; and indeed war and navigation seem to be the two grand causes of the improvements both in geography and astronomy. Athenæus quotes Bæton as author of a work intitled, The Encampments of Alexander's March; and likewise Amyntas to the same purpose. Pliny observes that Diognetus and Bæton were the surveyors of Alexander's marches, and then quotes the exact number of miles according to their mensuration; which he afterwards confirms by the letters of Alexander himself. The same author also remarks that a copy of this great monarch's surveys was given by Xenocles his treasurer to Patrocles the geographer, who was admiral of the fleets of Seleucus and Antiochus. His book on geography is often quoted both by Strabo and Pliny; and it seems that this author furnished Eratosthenes with the principal materials for constructing his map of the oriental part of the world.

Eratosthenes first attempted to reduce geography to a regular system, and introduced a regular parallel of latitude, which began at the straits of Gibraltar, passed eastwards through the isle of Rhodes, and so on to the mountains of India, noting all the intermediate places through which it passed. In drawing this line, he was not regulated by the same latitude, but by observing where the longest day was 14 hours and a half, which Hipparchus afterwards determined was the latitude of 36 degrees.

This first parallel through Rhodes was ever after considered with a degree of preference, in constructing all the ancient maps; and the longitude of the then known world was often attempted to be measured in stadia and miles, according to the extent of that line, by many succeeding geographers.

Eratosthenes soon after attempted not only to draw other parallels of latitude, but also to trace a meridian at right angles to these, passing through Rhodes and Alexandria down to Syene and Meroë; and at length he undertook the arduous task of determining the circumference of the globe, by an actual measurement of a segment of one of its great circles. To find the magnitude of the earth, is indeed a problem which has engaged the attention of astronomers and geographers ever since the spherical figure of it was known. It seems Anaximander was the first among the Greeks who wrote upon this subject. Archytas of Tarentum, a Pythagorean, famous for his skill in mathematics and mechanics, also made some attempts in this way.

As to the methods of measuring the circumference of the earth, it would seem, from what Aristotle says in his treatise De Cœlo, that they were much the same as those used by the moderns, deficient only in the accuracy of the instruments. That philosopher there says, that different stars pass through our zenith, according as our situation is more or less northerly; and that in the southern parts of the earth stars come above our horizon, which are no longer visible if we go northward. Hence it appears that there are two ways of measuring the circumference of the earth; one by observing stars which pass through the zenith of one place, and do not pass through that of another; the other, by observing some stars which come above the horizon of one place, and are observed at the same time to be in the horizon of another. The former of these methods, which is the best, was followed by Eratosthenes at Alexandria in Egypt 250 years before Christ. See Degree.

In the time of Pompey the Great, Posidonius determined the measure of the circumference of the earth by the second method above hinted by Aristotle, viz. the horizontal observations. Knowing that the star called Canopus was but just visible in the horizon of Rhodes, and at Alexandria finding its meridian height was the 48th part of a great circle in the heavens, or 7½ degrees, answering to the like quantity of a circle on the earth: then, supposing these two places under the same meridian, and the distance between them 5000 stadia, the circumference of the earth will be 240,000 stadia, which is the first measure of Posidonius. But, according to Strabo, Posidonius made the measure of the earth to be 180,000 stadia, at the rate of 500 stadia to a degree. The reason of this difference is thought to be, that Eratosthenes measured the distance between Rhodes and Alexandria, and found it only 3750 stadia: taking this for a 48th part of the earth's circumference, which is the measure of Posidonius, the whole circumference will be 180,000 stadia. This measure was received by Marinus of Tyre, and is usually ascribed to Ptolemy. But this measurement is subject to great uncertainty, both on account of the great refraction of the stars near the horizon, the difficulty of measuring the distance at sea between Rhodes and Alexandria, and by supposing those places under the same meridian, when they are really very different.

Several geographers afterwards made use of the different heights of the pole in distant places under the same meridian, to find the dimensions of the earth. About the year 800, the khalif Almamun had the distance measured between two places that were two degrees asunder, and under the same meridian in the plains of Sinjar near the Red Sea: and the result was, that the degree at one time was found equal to 56 miles, and at another 56¼ or 56⅔ miles.

The next attempt to find out the circumference of the earth was in 1525 by Fernelius, a learned philosopher of France. For this purpose, he took

the height of the pole at Paris, going from thence directly northwards, till he came to the place where the height of the pole was one degree more than at that city. The length of the way was measured by the number of revolutions made by one of the wheels of his carriage; and, after proper allowances for the declivities and turnings of the road, he concluded that 68 Italian miles were equal to a degree on the earth.

According to these methods, many other measurements of the earth's circumference have since that time been made, with much greater accuracy. See DEGREE and EARTH.

Though the maps of Eratosthenes were the best of his time, they were yet very imperfect and inaccurate. They contained little more than the states of Greece, and the dominions of the successors of Alexander, digested according to the surveys above mentioned. He had indeed seen, and has quoted, the voyages of Pythias into the great Atlantic ocean, which gave him some faint idea of the western parts of Europe; but so imperfect, that they could not be realized into the outlines of a chart. Strabo says he was very ignorant of Gaul, Spain, Germany, and Britain; and he was equally ignorant of Italy, the coasts of the Adriatic, Pontus, and all the countries towards the north.

Such was the state of geography, and the nature of the maps, before the time of Hipparchus. He made a closer connection between geography and astronomy, by determining the latitudes and longitudes from celestial observations. From his time nothing of any consequence to deserve recording occurs till about 150 years after Christ, when Ptolemy composed his system of geography. The chief materials he employed in composing this work, were the proportions of the gnomon to its shadow, taken by different astronomers at the times of the equinoxes and solstices; calculations founded on the length of the longest days; the measured or computed distances of the principal roads contained in the Roman itineraries and surveys; the various reports of travellers and navigators; and the works of preceding authors, particularly Strabo, who published under Augustus. All these were compared together, and digested into one uniform body or system. This system, however, was very imperfect, containing some great errors, which are pointed out in Blair's History of Geography: nevertheless it continued in vogue till the last three or four centuries, within which time, the great improvements in astronomy, the discoveries of new countries by navigators, and the progress of commerce and of arms, have contributed to a very great degree of perfection.

From an observation of the diversity in the length of the days and nights, the rising and setting of the sun, with the other phenomena, the antient geographers divided the surface of the earth into certain districts, which they called climates; and instead of the method of describing the situation of places by their latitude and longitude as we do now, they contented themselves with mentioning the climate in which they were situated.

This method of dividing the surface of the earth into climates, though now very much disused, has been adopted by several modern geographers. Some of these begin their climates at the equator, reckoning them by the increase of half an hour in the length of the day northward. Thus they go on till they come to the polar circles, where the longest day is 24 hours: betwixt these and the poles they count the climates by the increase of a natural day in the length of time that the sun continues above the horizon, until they come to one where the longest day is 15 of ours or half a month; and from this to the pole they count by the increase of half-months or whole months, the climates ending at the poles where the days are six months long. The climates betwixt the equator and the polar circles are called hour climates, and those between the polar circles and the poles are called month climates. In common language, however, we take the word climate in a very different sense; so that when two countries are said to be in different climates, we understand only that the temperature of the air, seasons, &c. are different. See CLIMATE.

From the difference in the length and positions of the shadows of terrestrial substances, ancient geographers have given different terms to the inhabitants of certain places of the earth; the reason of which will be easily understood from the following considerations: 1. Since the sun in his apparent annual revolution never removes farther from the equator than $23\frac{1}{2}$ degrees, it follows, that none of those who live without that space, or beyond the tropics, can have the luminary vertical to them at any season of the year. 2. All who live between the tropics have the sun vertical twice a year, though not all at the same time. Thus, to those who live directly under the equator, he is directly vertical in March and September at the time of the equinox. If a place is in 10° north latitude, the sun is vertical when he has 10° north declination, and so of every other place. 3. All who live between the tropics have the sun at noon sometimes north and sometimes south of them. Thus those who live in a place situated in 20° north latitude have the sun at noon to the northward when he has more than 20 degrees north declination, and to the southward when he has less. 4. Such of the inhabitants of the earth as live without the tropics, if in the northern hemisphere, have the sun at noon to the southward of them, but to the northward if in the southern hemisphere.—1. Hence when the sun is in the zenith of any place, the shadow of a man or any upright objects falls directly upon the place where they stand and consequently is invisible; whence the inhabitants of such places were called Ascii, or without shadows. 2. Those who live between the tropics, and have the sun sometimes to the north and sometimes to the south of them, have of consequence their shadows projecting north at some seasons of the year, and south at others, whence they were called Amphiscii, or having two kinds of shadows. 3. Those who live without the tropics have their noon-shadows always the same way, and are therefore called Heteroscii, that is, having only one kind of shadow. If they are in north latitude, the shadows are always turned towards the north, and if in the southern hemisphere, towards the south. 4. When a place is so far distant from the equator that the days are 24 hours long, or longer, the inhabitants were called Periscii, because their shadows turn round them.

Names have likewise been imposed upon the inhabitants of different parts of the earth from the parallels of latitude under which they live, and their situation with regard to one another. 1. Those who lived at distant places, but under the same parallel, were colled Periæci, that is, living in the same circle. Some writers, however, by the name of Periæci distinguish those who live under opposite points of the same parallel, where the noon of one is the midnight of the other. 2. When two places lie under parallels equally distant from

the equator, but in opposite hemispheres, the inhabitants were called Antæci. These have a similar increase of days and nights, and similar seasons, but in opposite months of the year. According to some, the Antæci were such as lived under the same geographical meridian, and had day and night at the same time. 3. If two places are in parallels equally distant from the equator, and in opposite meridians, the inhabitants were called Antipodes, that is, having their feet opposite to one another. When two persons are Antipodes, the zenith of the one is the nadir of the other. They have a like elevation of the pole, but it is of different poles; they have also days and nights alike, and similar seasons of the year, but they have opposite hours of the day and night, as well as seasons of the year. Thus when it is midday with us, it is midnight with our Antipodes; when it is summer with us, it is winter with them, &c.

From the various appearances of the sun, and the effects of his light and heat upon different parts of the earth, the division of it into zones has arisen. These are five in number. 1. The torrid zone, lying between the two tropics for the space of 47° of latitude. This is divided into two equal parts by the equator. 2. The two temperate zones lie between the polar circles and the tropics, containing a space of 43° of latitude. And, 3. The two frigid zones lie between the polar circles and the poles. In these last the longest day is never below 24 hours; in the temperate zones it is never quite so much, and in the torrid zone it is never above 14. The zones are named from the degree of heat they were supposed to be subjected to. The torrid zone was supposed by the ancients to be uninhabitable, on account of its heat; but this is now found to be a mistake, and many parts of the temperate zones are more intolerable in this respect than the torrid zone itself. Towards the polar circles also these zones are intolerably cold during the winter season. Only a small part of the northern frigid zone, and none of the southern, is inhabited. Some geographers reckoned six zones, dividing the torrid zone into two by the equator.

The natural division of the surface of the globe is into sea and land; about three-fourths of the whole being occupied by water, although probably no where to a depth comparatively very considerable, at most, of a few miles on an average. The remaining fourth consists of lands, elevated more or less above the level of the sea, interspersed, in some parts, with smaller collections of water, at various heights, and in a few instances, somewhat lower than the general surface of the main ocean. Thus the Caspian Sea is said to be about three hundred feet lower than the ocean; and in the interior parts of Africa there is probably a lake equally depressed.

Hence arise the following technical terms: A continent is a large portion of the earth, which comprehends several countries that are not separated by any sea; such are Europe, Asia, Africa, and America. An island is a part of the earth which is entirely surrounded by water; as Great Britain. A peninsula is a tract of land almost surrounded with water, and is joined to a continent only by a narrow slip or neck; such is the Morea in Greece. An isthmus, or neck of land, is that part by which a peninsula is joined to a continent, or two continents together; as the isthmus of Suez, which joins Africa to Asia. A promontory, or cape, is a high part of land which stretches into the sea; thus the Cape of Good Hope is a promontory. An ocean is a vast collection of waters surrounding a considerable part of the continent; as the Atlantic. A sea is a smaller collection of waters; as the Black Sea. A gulf is a part of the sea which is nearly surrounded with land; as the gulf of Venice. A bay has a wider entrance than a gulf; as the Bay of Biscay. A strait is a narrow passage that joins two seas; as the Strait of Gibraltar, which joins the Mediterranean to the Atlantic. A lake is a large collection of water entirely surrounded by land, having no visible communication with the sea; as the Caspian Lake in Asia. A river is a stream of water that has its source from a spring, which keeps continually running till it falls into some other river, or into the sea.

The ancients considered the globe under the three grand divisions of Asia, Europe, and Africa. Here the distinctions were arbitrary, as they often included Egypt under Asia, and they had not discovered the limits of Europe towards the N. E. Modern discoveries have added a fourth division, that of America, which exceeding even Asia in size, might have been admitted under two grand and distinct denominations, limited by the isthmus of Darien. Till within these last thirty years it was supposed that a vast continent existed in the south of the globe; but the second navigation of captain Cook dispelled the idea, and demonstrated that if any continent existed there, it must be in the uninhabitable ice of the south pole. The vast extent of New Holland rewarded the views of the enterprize; this, which seems too large to be ranked among islands, and too small for a continent, eludes the petty distinctions of man: and while geographers hesitate whether to ascribe it to Asia, or to denominate it a fifth specific division of the earth, it is not improbable that the popular division of four quarters will still predominate over all speculative discussions.

Of the grand divisions of the earth, Asia has ever been esteemed the most populous; and is supposed to contain five hundred millions of souls, if China, as has been averred by the latest writers, comprizes three hundred and thirty millions. The population of Africa may be estimated at thirty millions, of America at twenty millions, and one hundred and fifty millions may perhaps be assigned to Europe.

We cannot observe any general symmetry in the distribution of the earth's surface; excepting that the two large continents of Africa and South America have some slight resemblance in their forms, and that each of them is terminated to the eastward by a collection of numerous islands. The large capes projecting to the southward have also a similarity with respect to their form, and the islands near them; to the west the continents are excavated into large bays, and the islands are to the east: thus Cape Horn has the Falkland Islands; the Cape of Good Hope, Madagascar; and Cape Comorin, Ceylon to the east.

The great continent, composed of Europe, Asia, and Africa, constitutes about a seventh of the whole surface of the earth; America about a sixteenth; and Australasia, or New South Wales, about a fiftieth; or in hundredth parts of the whole, Europe contains two; Asia, seven; Africa, six; America, six; and Australasia, two; the remaining seventy-seven being sea; although some authors assign seventy-two parts only out of one hundred to the sea, and twenty-eight to the land.

These proportions may be ascertained with tolerable accuracy, by weighing the paper made for

covering a globe, first entire, and then cut out according to the terminations of the different countries; or, if still greater precision were required, the greater parts of the continents might be divided into known portions of the whole spherical surface, and the remaining irregular portions only weighed.

The general inclinations and levels of the continents are discovered by the course of their rivers. Of these the principal are, the rivers of the Amazons, the Senegal, the Nile, the river St. Lawrence, the Hoangho, the river La Plata, the Jenisei, the Mississippi, the Volga, the Oby, the Amur, the Oronooko, the Ganges, the Euphrates, the Danube, the Don, the Indus, the Dnieper, and the Dwina; and this is said to be nearly the order of their magnitudes. But if we class them according to the length of the country through which they run, the order will, according to Major Rennel's calculation, be somewhat different; taking the length of the Thames for unity, he estimates that of the river of Amazons, at 15¾; the Kian Kew, in China, 15½; the Hoango, 13½; the Nile, 12½; the Lena, 11½; the Amur, 11; the Oby, 10½; the Jenisei, 10; the Ganges, its companion the Burrampooter, the river of Ava, and the Volga, each 9½; the Euphrates, 8½; the Mississippi, 8; the Danube, 7; the Indus, 5¼; and the Rhine, 5¼.

We may form a tolerably accurate idea of the levels of the ancient continent, by tracing a line across it in such a direction as to pass no river, which will obviously indicate a tract of country higher than most of the neighbouring parts. Beginning at Cape Finisterre, we soon arrive at the Pyrennees, keeping to the south of the Garronne, and the Loire.

After taking a long turn northwards, to avoid the Rhine, we come to Swisserland, and we may approach very near to the Mediterranean in the state of Genoa, taking care not to cross the branches of the Po. We make a circuit in Swisserland, and pass between the sources of the Danube, and of the branches of the Rhine, in Swabia. Crossing Franconia, we leave Bohemia to the north, in order to avoid the Elbe; and coming near to the borders of Austria, follow those of Hungary to the south of the Vistula. The Dnieper then obliges us to go northwards through Lithuania, leaving the Don wholly to the right; and the Volga, to pass still further north, between Petersburg and Moscow, a little above Bjelosero. We may then go eastwards to the boundary of Asia, and thence northwards to Nova Zembla. Hence we descend to the west of the Oby, and thence to the east of the branches of the Volga, and the other inland rivers flowing into the lake Aral and the Caspian Sea. Here we are situated on the widely-extended elevation of India, in the neighbourhood of the sources of the Indus; and, lastly, in our way from hence towards Kamschatka, we leave the Jenisei and Lena on the left, and the Ganges, Kiang Kew, the Hoangho, and the Amur, to the right.

The direction of the most conspicuous mountains is, however, a little different from this; the principal chain first constitutes the Pyrennees, and divides Spain from France, then passes through the Vivarais and Auvergne, to join the Alps, and through the South of Germany to Dalmatia, Albania, and Macedonia; it is found again beyond the Euxine, under the names of Taurus, Caucasus, and Imaus. and goes on to Tartary, and to Kamschatka. The peninsula of India is divided from north to south by the mountains of Gate, extending from the extremity of Caucasus, to Cape Comorin. In Africa, Mount Atlas extends from Fez to Egypt, and the mountains of the Moon run nearly in the same direction: there is also a considerable elevation between the Nile and the Red Sea. In the new world, the neighbourhood of the western coast is the most elevated; in North America, the Blue Mountains, or Stony Mountains, are the most considerable; and the mountains of Mexico join the Andes or Cordeliers, which are continued along the whole of the west coast of South America.

There are several points in both hemispheres, from which we may observe rivers separating to run to different seas; such are Swisserland, Bjelosero, Tartary, Little Tibet, Nigritia or Guinea, and Quito. The highest mountains are Chimboraçao, and some others of the Cordeliers in Peru, or perhaps Descabesado in Chili, Mont Blanc, and the Peak of Teneriffe. Chimboraçao is about seven thousand yards, or nearly four miles, above the level of the sea; Mont Blanc, five thousand, or nearly three miles; the Peak of Teneriffe about four thousand, or two miles and a quarter; Ophir, in Sumatra, is said to be five or six hundred feet higher. It has, however, been asserted, that some of the snowy mountains to the north of Bengal are higher than any of those of South America. The plains of Quito, in Peru, are so much elevated, that the barometer stands at the height of fifteen inches only, and the air is reduced to half its usual density. But none of these heights is equal to a thousandth part of the earth's semi-diameter, and the greatest of them might be represented on a six-inch globe by a single additional thickness of the paper with which it is covered. Mount Sinai, in Japan, Mount Caucasus, Etna, the Southern Pyrenees, St. George among the Azores, Mount Adam in Ceylon, Atlas, Olympus, and Taurus, are also high mountains; and there are some very considerable elevations in the island of Owyhee. Ben Nevis, in Scotland, is the loftiest of the British hills, but its height is considerably less than a mile.

The most elevated mountains, excepting the summit of volcanos, consist of rocks, more or less mixed, without regular order, and commonly of granite or porphyry. These are called primary mountains; they run generally from east to west in the old world, and from north to south in the new; and many of them are observed to be of easier ascent on the east than the west side. The secondary mountains accompany them in the same direction; they consist of strata, mostly calcareous and argillaceous, that is, of the nature of lime-stone and clay, with a few animal and vegetable remains, in an obscure form, together with salt, coals, and sulphur. The tertiary mountains are still smaller; and in these, the animal and vegetable remains are very abundant; they consist chiefly of lime-stone, marble, alabaster, building-stone, mill-stone, and chalk, with beds of flint. Where the secondary and tertiary mountains are intersected by valleys, the opposite strata often correspond at equal heights, as if the valleys had been cut or washed from between them; but sometimes the mountains have their strata disposed as if they had been elevated by an internal force, and their summits had afterwards crumbled away, the strata which are lowest in the plains being highest in the mountains. The strata of these mountains are often intermixed with veins of metal, running in all possible directions, and occupying vacuities which appear to be of somewhat later date than

the original formation of the mountains. The *volcanic mountains* interrupt those of every other description, without any regularity, as if their origin were totally independent of all the rest.

The internal constitution of the earth is very little known from actual observation, for the depths to which we have penetrated are *comparatively* very inconsiderable, the deepest mine scarcely descending half a mile perpendicularly. It appears that the strata are more commonly in a direction nearly horizontal, than in any other; and their thickness is usually almost equable for some distance; but they are not disposed in the order of their specific gravity, and the opinion of their following each other in a similar series, throughout the greater part of the globe, appears to rest on very slight foundations.

Among the moderns, the chief authors on the subject of Geography are Johannes de Sacrobosco, or John Hallifax, who wrote a Treatise on the sphere: Sebastian Munster, in his Cosmographia Universalis, in 1559; Clavius, on the sphere of Sacrobosco; Piccioli's Geographia et Hydrographia Reformata; Weigelius's Speculum Terræ; De Chales's Geography, in his Mundus Mathematicus; Cellarius's Geography; Cluverius's Introductio in Universam Geographiam; Leibnecht's Elementa Geographiæ Generalis; Stevenius's Compendium Geographicum; Wolfius's Geographia, in his Elementa Matheseos; Busching's New System of Geography; Gordon's, Salmon's, and Guthrie's Grammars; Adams's Geography, ancient and modern; and Pilkington's Geography, lately published in two vols. 4to., with an introduction by Mr. Vince. But, as an excellent scientific work, we must not omit Varenius's Geographia Generalis, with Jurin's additions: we really wish some gentleman of talents would publish a new edition of this admirable work, suited to the present state of the science. Dr. Playfair has recently published a system of Geography, which is, in many respects, a valuable performance.

In studying *particular Geography*, recourse must be had to voyages and travels: the collections of Mavor, and that by Pinkerton now publishing, may be safely recommended. We must also mention

- Pennant's Tours in Britain.
- Young's Tours in the British Isles.
- Saintfond's Travels in England and Scotland.
- Holcroft's Tour in France.
- Spallanzani's Travels in the Two Sicilies.
- Coxe's Travels in Russia, &c.
- Porter's in Do.
- Pallas's Travels in the Russian Empire.
- Carr's Northern Summer, and his other volumes of Travels.
- Staunton's Account of China.
- Barrow's Travels in China.
- Percival's Account of Ceylon.
- Cordiner's Do.
- Symes's Embassy to Ava.
- Collins's Account of New South Wales.
- Bruce's Travels in Abyssinia.
- Barrow's Travels in Africa.
- Park's Travels in the Interior of Africa.
- Browne's Travels in Africa.
- Sonnini's Travels in Egypt.
- Acerbi's Journey to the North Cape.
- Percival's Cape of Good Hope.
- Mackenzie's Journey in North America.
- Davis's Travels in America.
- Pinckard on the West Indies.
- Mackinnon's Tour in the West Indies.
- The Moravian accounts of their Mission in the interior of America: with the Voyages of Anson, Byron, Cooke, Phipps, Bligh, Wilson, Wallis, La Peyrouse, Perron, &c. (*Blair, Gregory, Hutton, Nicholson, Pinkerton*).

GEOLOGICAL. *a.* (from *geology*.) *Relating to the subject of geology.*

GEOLOGY. (from γη, the earth, and λογος, a discourse, or treatise.) That part of natural philosophy which treats of the structure of the earth, in regard to the origin, composition, and decomposition of its solid contents. Thus explained, mineralogy should seem to be a branch of geology: but the former term has of late years been carried to such an extent by the most popular mineralogist of his day, M. Werner, as to include not only geology, properly so called, but every thing immediately connected with it: the situation of the materials constituting the solid contents of the earth, so far as we have been able to examine them, as well as their mode of origin, and the veins by which they are intersected. And hence, in the Wernerian system, geology becomes a branch of mineralogy; and, in order to prevent confusion, from the subjection of what has hitherto been regarded as a classific term to an ordinal station, the word geognosy has been invented to supply its place. See MINERALOGY.

The object of geology, then, is to unfold the structure of the globe; to discover by what causes its parts have been arranged; from what operations have originated the general stratification of its materials, the inequalities with which its surface is diversified, and the immense number of different substances of which it is composed.

In pursuing this investigation, many difficulties occur to us. The bare surface or mere crust of the solid substance of the earth is the whole that we are capable of boring into, or of acquiring a knowledge of, even by the deepest clefts of volcanoes, or the bottoms of the deepest seas. It is not often, however, that we have a possibility of examining either seas or volcanoes at their bottom: the inhabitable part of the globe bears but a small portion to the uninhabitable, and the civilized an infinitely smaller proportion still. Hence, our experience must be necessarily extremely limited; a thousand facts may be readily conceived to be unfolded that we are incapable of accounting for, and a variety of systems that shall, nevertheless, aim at an explanation.

So far as the superficies of the earth has been laid open to us by ravines, rivers, mines, &c. we find it composed of stony masses, sometimes simple, as lime-stone, serpentine, or quartz; but more frequently compound, or composed of two or more simple materials, variously mixed and united together, as granite, which is a composition of quartz, felspar, and mica. These stony masses, or rocks, are numerous, and they appear to be laid one over the other, so that a rock of one kind of stone is covered by another species of rock, and this by a third, and so on. In this superposition of rocks, it is easily observable, that their situation is not arbitrary: every stratum occupies a determinate place, so that they follow each other in regular order from the deepest part of the earth's crust, which has been examined, to the very surface. Thus there are two things respecting rocks, that peculiarly claim our attention; their composition and their relative situation. But, besides the rocks which constitute the earth's crust, there are other masses which must also be considered. These traverse the rocks in a different

direction, and are known by the name of veins, as if the rocks had split asunder in different places from top to bottom, and the chasms had been afterwards filled up with the matter which constitutes the vein.

Independently of the substances thus presented to us, we meet with facts that prove most decisively that the general mass has undergone various revolutions at various times, and revolutions not only of great antiquity, but of universal extent. We have the most unexampled proof, that its whole surface has been covered with ocean, and that every part of it has suffered change; mountains have been raised, plains levelled, islands separated from a continent, and the waters collected so as to leave an elevated land. We find it difficult to conceive causes adequate to the production of such effects; and operations so immense seem too remote from any means of investigation which we possess, to admit of being explained.

One point, however, in the midst of all the intricacy that surrounds us still remains decided, that the shell of the globe has, at some period or other, been in a state of fluidity, and that from this circumstance has arisen its present arrangement. Now the only two causes that can enter into the mind of man as being competent to such an effect are the operation of fire or of some solvent: and hence our researches become in some degree limited to the inquiry by which of these means this effect has been induced. If a solvent have been the cause, that solvent must have been water, for there is no other fluid in nature in sufficient abundance to have acted the part of a solvent upon a scale so prodigious.

Hence, then, two distinct theories arise, which appear to have been agitated with considerable warmth in former times, but with a much greater degree of warmth, and much deeper view of the subject, in the present day. Is the present structure of the solid contents of the earth, so far as it is capable of examination, the result of igneous fusion, or of aqueous solution? Is the Plutonic or the Neptunian system founded on the strongest basis? In ancient times Heraclitus took the lead as to the former: and Thales, or rather, perhaps, Epicurus, as to the latter. In our own day, though the Plutonic theory was first started by M. Buffon, its defenders are now chiefly confined to our own country, and consist of Dr. Hutton, professor Playfair, and very lately of sir James Hall; names unquestionably highly respectable, and entitled to every deference, but most powerfully opposed by the respectable authorities of Werner, de Saussure, and Kirwan, not to mention that the general voice of geologists is very considerably in favour of the Neptunian theory, or that entertained by the last-mentioned philosophers.

Plutonic Theory.—1. According to this system there is in the substance either of the entire globe, or throughout the entire crust of it with which we are acquainted, a regular series of decay and renovation, and the processes by which these are affected have an uniform relation to each other. The hardest rocks are worn down by air and water, causes which, however slowly they may operate, are constant in their action, and which, therefore, in indefinite time, must be equal to the production of the greatest effect. From the figure of the surface of the earth, the decayed materials must be carried towards the ocean, and ultimately deposited in its bed. This transportation may be impeded by local causes, or may, in general, be extremely slow, yet from the declivity of the land it must necessarily take place, and may, therefore, be admitted as an uniformly operating cause.

2. It is further assumed, that at certain depths in the mineral regions an immense heat is constantly present; a heat which operates in the fusion and consolidation of the substances deposited in these regions. To the action of this subterraneous fire the formation of all our strata is attributed, for by this they are again sublimed, and exposed to view in different states of combination and perfection. These strata, therefore, consist of the wrecks of a former world, which have been more or less completely fused by this agent, and by subsequent cooling have been consolidated.

The subterraneous fire to which these effects are ascribed is conceived to operate under the modification of compression, in consequence of which, from various facts appealed to, and to a certain extent confirmed by some very valuable experiments by sir James Hall, (provided those experiments should bear the test of farther enquiry) it seems pretty clearly ascertained, that when certain gasses appertaining to the fusible substance, as carbonic acid for example, are rendered incapable of flying off, a much less quantity of actual heat is sufficient for the purpose of fusion, than when such gasses, freed from a heavy superincumbent pressure, have a possibility of escaping. Now the subterraneous fire being placed at immense depths, the substances on which it operates must be enormously compressed; which compression will prevent their volatilization in whole or in part: and from this circumstance it is possible, we are told, to explain appearances and qualities in minerals, and to answer various objections, which would otherwise weigh heavy against the hypothesis.

3. The elevation of the strata is in like manner the result of this same subterraneous heat: and it is contended that nothing but the extensive and forcible power which is hereby produced can be fairly conceived adequate to such an effect.

The first of these positions is not very objectionable, and as far as relates to its general principle, separated from the positions with which it is connected, may be admitted. It may be allowed by the Neptunian as well as by the Plutonic geologist, that the strata of the earth are liable to waste, and that the materials are carried forward to the sea: but the appearance of lime-stones and marbles containing shells, in which the sparry structure is as perfect as it is in the primary limestone, and in which are distributed veins of crystallized carbonat of lime, this, and a variety of facts like this, must at all times militate fatally against the agency of fire in the production of such sparry structure, and such veins of crystallization; for in every instance in which it is found sufficient to produce such a structure, it must necessarily have destroyed every vestige of the structure of the shells, and have altogether dissipated the carbonic acid, necessary for the veins of crystallized carbonat of lime.

Against the second position the objections are indeed strong, and, if we mistake not, insuperable. "It is not fire, says Mr. Playfair, in the usual sense of the word, but heat, which is required for this purpose: and there is nothing chimerical in supposing that nature has the means of producing heat, even in a very great degree, without the assistance of fuel, or of vital air. Friction is a source of heat, unlimited, for what we know, in

its extent; and so perhaps are other operations, both chemical and mechanical; nor are either combustible substances or vital air concerned in the heat thus produced. So also, the heat of the sun's rays in the focus of a burning glass, the most intense that is known, is independent of the substance just mentioned; and though the heat would not calcine a metal, nor even burn a piece of wood, without oxygenous gass, it would doubtless produce as high a temperature in the absence as in the presence of that gass." From these and other experiments, he concludes "that it is not absurd to suppose, that the heat of great, dense, and fixed bodies may be consumed by the greatness of the bodies, and the mutual action and reaction between them and the heat they emit."

In reply to this argument, which, we admit, is very ingeniously conducted, it is forcibly asked, by the author of the Comparative View of the two systems, in direct reply to Mr. Playfair's Illustrations of the Huttonian Theory, "To what purpose are the various sources of heat enumerated in this reasoning? To prove that it may exist, or be produced independent of burning. This will be readily granted; but the reasoning can prove nothing farther. It can be satisfactorily shewn that any of the known causes of heat are as incapable of producing it in the interior parts of the globe, to that extent which must be supposed in the Huttonian theory, as combustion, which, even by its defenders, is confessed to be inadequate to that purpose."

In regard to the third general position, that the strata, after having been fused and consolidated by subterranean heat, are elevated by the same power, the same general objection is applicable, which has been already urged against the preceding principle, viz. the difficulty or impossibility of obtaining and preserving a degree of heat sufficient for such a purpose. And even were this granted, no principle is pointed out in the theory, by which the action of such a power can be regulated; why it may not anticipate or be too late for its due season of action, and be as often the cause of havoc and disorder, as it is asserted to be the regular and pre-ordained instrument of the renovation of a continent. Hence, the principle assumed is at once gratuitous and improbable.

In a work restricted, as is the Pantologia, to narrow extent in the discussion of the different articles of which it is composed, it is always a point of very considerable consequence to detect insuperable objections to a system *in limine*: for it enables the editors to appropriate many of their pages, which would otherwise be devoted to the same subject, to inquiries of more importance, because vested on a firmer foundation. If the objections to the Plutonic theory, as already urged, few as they are, be conceived decisive (and we can scarcely imagine any other verdict from our readers), we may well be saved the trouble of pointing out those inconsistencies it labours under, as well in regard to the actual *position* of many of the stony rocks of the globe contemplated in mass, as in the appearances and properties of individual fossils: though we feel persuaded that the arguments resulting from a minute investigation into both these points, would be altogether as complete as in the question of principle. It is sufficient, however, to observe, that notwithstanding its magnificence of structure, and extent of application, notwithstanding the speciousness of its first introduction, and the talents with which it has been supported, the Plutonic theory is built upon assumption alone. It lays down principles which it cannot support, and in stating observations to other theories, it rather clears the way for the advance of something unborn than establishes its own positions.

Neptunian theory.—Under this view of the origin and structure of the globe, less superb indeed, but possessing a much wider appeal to facts than the preceding, it is conceived that aqueous solution has been the agent by which the phænomena on the superficies of the globe have been produced. It is conceived that the materials of which our strata consist were at one time dissolved or suspended in water, and that from this fluid they have successively consolidated in various combinations, partly by crystallization, and partly by mechanical decomposition. Granite being the rock which composes the most elevated part of the globe, and which likewise forms the basis on which the greater number of the strata rest, is supposed to have been first formed, the different parts of which it consists, felspar, quartz and mica, having concreted by a crystallization nearly simultaneous. This is conceived to have been accompanied with, and followed by, a similar consolidation of the other primitive strata, gneis, micareous schist, argillaceous schist, porphyry, quartz, &c.

Those rocks compose the chief elevations of the globe. They are never found to contain any organic remains, and of course their formation must have been prior to the existence of the vegetable and animal kingdoms.

From the period of the formation of these strata, it is contended that the water covering the surface began to diminish in height by retiring gradually into cavities in the internal parts of the earth. And if we may be permitted to recur, by an effort of the imagination, to that epocha in which, according to sacred and profane historians, the water and earth were confounded, and the confused mixture of all principles formed a chaos, we shall see that the laws of gravity inherent in matter must have carried it down, and necessarily produced the arrangement which observation at present exhibits to us. The water, as the least heavy, must have purified itself, and arisen to the surface by a filtration through the other materials: while the earthy principles must have precipitated, and formed a mud, in which all the elements of stones were confounded. In this very natural order of things, the general law of affinities, which continually tends to bring together all analogous parts, must have exerted itself with its whole activity upon the principles of this almost fluid paste, and the result have been a number of bodies of a more definite kind, in crystals more or less regular; and from this muddy substance, in which the principles of the stones were confounded that compose the granite, a rock must have been produced, containing the elementary stones all in possession of their distinct forms and characters. In this manner it is that we observe salts of very different kinds develop themselves in waters which hold them in solution; and in this manner it still happens that crystals of spar and gypsum are formed in clays which contain their component parts.

It may easily be conceived that the laws of gravitation must have influenced the arrangement and disposition of the products. The most gross and heavy bodies must have fallen, and the lightest and most attenuated substances must have arranged themselves on the surface of the foregoing; and this it is which constitutes the primitive schists, the gneis, the rocks of mica, &c. which commonly

repose upon masses of coarse-grained granite. The disposition of the fine-grained granite in strata, or beds, appears to depend on this position, and the fineness or tenuity of its parts. Being placed in immediate contact with water, this fluid must naturally have influenced the arrangement which it presents to us; and the elements of this rock, being subjected to the effect of waves, and the action of currents, must have formed strata.

The rocks of granite being once established as the nucleus of the superficies of our globe, we may, from the analysis of its constituent principles, and by attending to the action of the various agents capable of altering it, follow the changes to which it has been subjected, step by step.

Water is the principal agent whose effects we shall examine. This fluid, collected in the cavity of the ocean, is carried by the atmosphere to the tops of the most elevated mountains, where it is precipitated in rain, and forms torrents, which return with various degrees of rapidity into the common reservoir. The uninterrupted motion and fall must gradually attenuate and wear away the hardest rocks, and carry their detached parts to distances more or less considerable. The action of the air, and the varying temperature of the atmosphere, facilitate the attenuation and the destruction of these rocks. Heat acts upon their surface, and renders it more accessible and more penetrable to the water which succeeds; cold divides them, by freezing the water which has entered into their texture; the air itself affords the acid principle, which attacks the limestone, and causes it to effloresce; the oxygen unites to the iron, and calcines it: insomuch that the concurrence of causes favours the disunion of principles; and consequently the action of water, which clears the surface, carries away the products of decomposition, and makes preparation for a succeeding process of the same nature.

The first effect of the rain is therefore to depress the mountains. But the stones which compose them must resist in proportion to their hardness; and we ought not to be surprised when we observe peaks which have braved the destructive action of time, and still remain to attest the primitive level of the mountains which have disappeared. The primitive rocks, alike inaccessible to the injury of ages as to the animated beings which cover less elevated mountains with their remains, may be considered as the source or origin of rivers and streams. The water which falls on their summits flows down in torrents by their lateral surfaces. In its course it wears away the soil upon which it incessantly acts. It hollows out a bed, of a depth proportioned to the rapidity of its course, the quantity of its waters, and the hardness of the rock over which it flows; at the same time that it carries along with it portions and fragments of such stones as it loosens in its course.

These stones, rolled along by the water, must strike together, and break off their projecting angles: a process that must quickly have afforded those rounded flints which form the beds of rivers. These pebbles are found to diminish in size, in proportion to the distance from the mountain which affords them; and it is to this cause that Mr. Dorthes has referred the disproportionate magnitude of the pebbles which form our ancient worn stones, when compared with those of modern date; for the sea extending itself formerly much more inland, in the direction of the Rhone, the stones which it received from the rivers, and threw back again upon the shores, had not run through so long a space in their beds as those which they at present pass over. Thus it is that the remains of the Alps, carried along by the Rhone, have successively covered the vast interval comprised betwcent he mountains of Dauphiny and Vivarais, and are carried into seas, which deposit them in small pebbles on the sh[ore].

The pulverulent remains of mountains, or the powder which results from the rounding of these flints, are carried along with greater facility than the flints themselves: they float for a long time in the water, whose transparency they impair; and when these same waters are less agitated, and their course becomes slackened, they are deposited in a fine and light paste, forming beds more or less thick, and of the same nature as that of the rocks to which they owe their origin. These strata gradually become drier by the agglutination of their principles; they become consistent, acquire hardness, and form siliceous clays, silex, petros lex, and all the numerous class of pebbles which are found dispersed in strata, or in banks, in the ancient beds of rivers. The mud is much more frequently deposited in the interstices left between the rounded flints themselves, which intervals it fills, and there forms a true cement that becomes hard, and constitutes the compound stones known by the name of pudding-stones and grit-stones; for these two kinds of stones do not appear to differ but in the coarseness of the grain which forms them, and the cement which connects them together.

We sometimes observe the granite spontaneously decomposed. The texture of the stones which form it has been destroyed; the principles or component parts are disunited and separated, and they are gradually carried away by the waters. Water filtrating through mountains of primitive rock, frequently carries along with it very minutely-divided particles of quartz; and proceeds to form, by deposition, stalactites, agates, rock crystal, &c. These quartzoes stalactites, differently coloured, are of a formation considerably analogous to that of calcareous alabasters; and we perceive no other difference between them than that of their constituent parts. Thus far we have exhibited, in a few words, the principal changes, and various modifications, to which the primitive rocks have been subjected. We have not yet observed either germination or life; and the metals, sulphur, and bitumens, have not hitherto presented themselves to our observation. Their formation appears to be posterior to the existence of this primitive globe; and the alterations and decompositions which now remain to be inquired into, appear to be produced by the class of living, or organized beings.

On the one hand, we behold the numerous class of shell animals, which cause the stony mass of our globe to increase by their remains. The spoils of these creatures, long agitated and driven about by the waves, and more or less altered by collision, form those strata and banks of lime-stone, in which we very often perceive impressions of those shells to which they owe their origin. On the other hand, we observe a numerous quantity of vegetables that grow and perish in the sea; and these plants, likewise deposited and heaped together by the currents, form strata, which are decomposed, lose their organization, and leave all the principles of the vegetable confounded with the earthy principle. It is to this source

that the origin of pit-coal, and secondary schistus, is usually attributed; and this theory is established on the existence of the texture of decomposed vegetables very usually seen in schisti and coal, and likewise on the presence of shells and fish in most of these products. It appears that the formation of pyrites ought in part to be attributed to the decomposition of vegetables: it exists in greater or less abundance in all schisti and coal. A wooden shovel has been found buried in the depositions of the river De Ceze, converted into jet and pyrites. The decomposition of animal substances may be added to this cause; and it appears to be a confirmation of these ideas, that we find many shells passing to the state of pyrites.

Not only the marine vegetables form considerable strata by their decomposition; but the remains of those which grow on the surface of the globe ought to be regarded among the causes or agents which concur in producing changes upon that surface. We shall separately consider how much is owing to each of these causes; and shall follow the effects of each, as if that cause alone was employed in modifying and altering our plane.

1. The secondary calcareous mountains are constantly placed upon the surface of the primitive mountains; and though a few solitary observations present a contrary order, we ought to consider this inversion and derangement as produced by shocks which have changed the primitive disposition. It must be observed also, that the disorder is sometimes merely apparent; and that some naturalists of little information have described calcareous mountains as inclining beneath the granite, because this last pierces through the envelope, rises to a greater height, and leaves at its feet, almost beneath it, the calcareous remains deposited at its base.

Sometimes even the lime-stone fills to a very great depth the crevices or clefts formed in the granite, sometimes schistus, or trap, occasionally containing petrifactions. These, in the Wernerian system, are called intermediate or transition rocks or strata. It likewise happens frequently enough that such waters as are loaded with the remains of the primitive granite heap them together, and form secondary granites which may exist above the calcareous stone. These calcareous mountains are decomposed by the combined action of air and water; and the product of their decomposition sometimes forms chalk or marle. The lightness of this earth renders it easy to be transported by water; and this fluid, which does not possess the property of holding it in solution, soon deposits it in the form of gurhs, alabasters, stalactites, &c. Spars owe their formation to no other cause. Their crystallization is posterior to the origin of calcareous mountains.

Waters wear down and carry away calcareous mountains with greater ease than the primitive mountains: their remains being very light, are rolled along, and more or less worn. The fragments of these rocks are sometimes connected by a gluten or cement of the same nature; from which process calcareous grit and breccias arise. These calcareous remains formerly deposited themselves upon the quartzose sand; and the union of primitive matter, and secondary products gives rise to a rock of a mixed nature.

2. The mountains of secondary schistus fre-[illegible] to us a pure mixture of earthy principles without the smallest vestige of bitumen. These rocks afford, by analysis, silex, alumina, magnesia, lime in the state of carbonate, and iron; principles which are more or less united, and consequently accessible in various degrees to the action of such agents as destroy the rocks hitherto treated of.

The same principles, when disunited, and carried away by waters, give rise to a great part of the stones which are comprised in the magnesian class. The same elements, worn down by the waters, and deposited under circumstances proper to facilitate crystallization, form the schorls, tourmaline, garnets, &c. We do not pretend by this to exclude and absolutely reject the system of such naturalists as attribute the formation of magnesian stones to the decomposition of the primitive rocks. But we think that this formation cannot be objected to for several of them, more especially such as contain magnesia in the greatest abundance.

It frequently happens that the secondary schists are interspersed with pyrites; and, in this case, the simple contact of air and water facilitates their decomposition. Sulphuric acid is thus formed, which combines with the various constituent principles of the stone; whence result the sulphates of iron, of magnesia, of alumina, and of lime, which effloresce at the surface, and remain confounded together. Schists of this nature are wrought in most places where alum works have been established: and the most laborious part of this undertaking consists in separating the sulphats of iron, of lime, and of magnesia from each other, which are mixed together. Sometimes the magnesia is so abundant that its sulphat predominates. The sulphat of lime, being very sparingly soluble in water, is carried away by that liquid, and deposited to form gypsium; while the other more soluble salts, remaining suspended, form vitrolic mineral waters. The pyritous schists are frequently impregnated with bitumen, and the proportions constitute the various quantities of pit-coal.

It appears that we may lay it down as an incontestable principle, that pyrite is abundant in proportion as the bituminous principle is more scarce. Hence it arises, that coals of a bad quality are the most sulphureous, and destroy metallic vessels, by converting them into pyrite. The foci of volcanos appear to be formed by a schist of this nature; and in the analyses of the stony matters which are ejected, we find the same principles as those which constitute this schist. We ought not therefore to be much surprised at finding schorls among volcanic products; and still less at observing that subterranean fibres throw sulphuric salts, sulphur, and other analogous products, out of the entrails of the earth.

3. The remains of terrestrial vegetables exhibit a mixture of primitive earths more or less coloured by iron: we may therefore consider these as a matrix in which the seeds of all stony combinations are dispersed. The earthy principles assort themselves according to the laws of their affinities; and form crystals of spar, of plaister, and even the rock crystals, according to all appearance: for we find ochreous earths in which these crystals are abundantly dispersed; we see them formed almost under our eyes. We have frequently observed indurated ochres full of these crystals terminating in two pyramids.

The ochreous earths appear to deserve the greatest attention of naturalists. They constitute one of the most fertile means of action, which nature employs; and it is even in earths nearly similar to these that she elaborates the diamond, in the kingdoms of Golconda and Visiapour.

The spoils of animals, which live on the surface of the globe, are entitled to some consideration among the number of causes which we assign to explain the various changes our planet is subjected to. We find bones in a state of considerable preservation in certain places; we can even frequently enough distinguish the species of the animals to which they have belonged. From indications of this sort it is that some writers have endeavoured to explain the disappearance of certain species; and to draw conclusions thence, either that our planet is perceptibly cooled, or that a sensible change has taken place in the position of the axis of the earth. The phosphoric salts and phosphorus which have been found, in our time, in combination with lead, iron, &c. prove that, in proportion as the principles are disengaged by animal decomposition, they combine with other bodies, and form the nitric acid, the alkalies, and in general all the numerous kinds of nitrous salts.

In examining, then, the merits of the antagonist systems of geology now offered, we have no objection to confess that to the Huttonian belongs the praise of novelty, boldness of conception and unlimited extent of view. It aspires not only to account for the present appearances of the earth, but to trace a plan by which the formation of successive worlds is developed: it seeks to extend that order and arrangement, that principle of balance and restoration observed in all the departments of nature, to the constitution of the globe itself.

With this system the Neptunian forms a perfect contrast. It presumes not to carry its researches beyond the commencement of the present world, or to extend them beyond its termination. All the phænomena of geology conspire to prove that water has been the great agent by which rocks have been formed, and the surface of the earth arranged. It does not pretend to deny the existence of subterranean fires to a certain extent, or that many of the phænomena which strike us most forcibly may be the result of such an agency; but it does deny that such an agency is the grand or general cause of the geological facts and appearances that accost us on every side, and denies still farther that any such fire or heat can exist to an extent competent to such an extent. While the science remains in an imperfect state deficiencies may be found in the application of its general principle. But we discover no inconsistencies with that principle, nor contradictions to known and established truths.

More especially do we feel disposed to adhere to this last theory from its general coincidence with the cosmogony of the holy scriptures. The Mosaic account indeed restrains the process of creation and the period in which the waters covered the entire surface of the globe to a limit in which "if the terms be understood in their strict and literal sense, the existing phænomena of nature seem to evince that they could not possibly have occurred: for it confines the entire work of creation within the compass of six days. In another part of the scriptures, however, we have undeniable proofs that the term day, instead of being restrained to a single revolution of the earth around its axis, is used in a looser and more general sense, for a definite, indeed, but a much more extensive period: and we have as ample a proof from the book of nature, the existing face of the earth, that the six days or periods referred to in the Mosaic cosmology imply epochs of much greater duration than so many diurnal revolutions as we have in the page of human history, that the same terms were employed with the same laxity of meaning by the prophet Daniel. Thus interpreted scepticism is driven from her last and inmost fortress: every subterfuge is annihilated, and the word and work of the Deity are in perfect unison with each other. That the Creator might have produced the whole by a single and instantaneous effort is not to be denied: but as both revelation and nature concur in asserting that such was not the fact, it is no more derogatory to him with whom a thousand years are but as one day, and one day as a thousand years, to suppose that he allotted six thousand years to the completion of his design than that he executed it in six days. And surely there is something far more magnificent in conceiving the world to have progressively attained form, order, and vitality, from the mere operation of powers communicated to it in a state of chaos, or unfashioned matter, than in supposing the actual and persevering exertions of the Almighty for a definite, although a shorter period of time."—*Good's Life of Lucretius*, p. lxxxi.

GEOMANCY, GEOMANTIA, a kind of divination, performed by means of a number of little points or dots made on paper at random; and considering the various lines and figures which those points present, and thence forming a pretended judgment of futurity, and deciding any question proposed. The word is of the Greek γη, *terra*, earth, and μαντεια, divination; it being the ancient custom to cast little pebbles on the ground, and thence to form their conjectures, instead of the points afterwards made use of. Polydore Virgil defines geomancy a kind of divination performed by means of clefts or chinks made in the ground, and takes the Persian Magi to have been the inventors of it.

GEOMANTIC. *a.* (from *geomancy.*) Pertaining to the art of geomancy.

GEO'METER. *s.* (γεωμετρης.) One skilled in geometry; a geometrician (*Watts*).

GEOMETRA, in entomology. See PHALÆNA.

GEO'METRAL. *a.* (*geometral*, French.) Pertaining to geometry.

GEOMETRICAL. GEOME'TRIC. *a.* (γεωμετρικος.) 1. Pertaining to geometry (*More*). 2. Prescribed or laid down by geometry. 3. Disposed according to geometry (*Grew*).

GEOMETRICAL LINE OR CURVE, called also algebraic line or curve, is that wherein the relations of the abscisses to the semiordinates may be expressed by an algebraic equation. See ALGEBRAIC CURVES.

Geometrical lines are distinguished into classes, orders, or genera, according to the number of the dimensions of the equation that expresses the relation between the ordinates and the abscisses: or, which often amounts to the same, according to the number of points in which they may be cut by a right line.

Thus, a line of the first order will be only a right line: those of the second, or quadratic order, will be the circle, and the conic sections; and those of the third, or cubic order, will be the cubical and Nelian parabolas, the cissoid of the ancients, &c.

But a curve of the first gender (because a right line cannot be reckoned among the curves) is the same with a line of the second order; and a curve of the second gender, the same with a line of the third order; and a line of an infinitesimal order is that, which a right line may cut in infinite points; as the spiral, helicoid, the quadratrix, and every line generated by the infinite revolutions of a radius.

It is to be observed that it is not so much the equation, as the construction or description, that makes any curve, geometrical, or not. Thus, the circle is a geometrical line, not because it may be expressed by an equation, but because its description is a postulate: and it is not the simplicity of the equation, but the easiness of the description, that is to determine the choice of the lines for the construction of a problem. The equation that expresses a parabola, is more simple than that which expresses a circle; and yet the circle, by reason of its more simple construction, is admitted before it. Again, the circle and the conic sections, with respect to the dimensions of the equations, are of the same order; and yet the circle is not numbered with them in the construction of problems, but by reason of its simple description is depressed to a lower order, viz. that of a right line; so that it is not improper to express that by a circle, which may be expressed by a right line; but it is a fault to construct that by the conic sections, which may be constructed by a circle.

Geometrical progression, a progression in which the terms have all successively the same ratio: as 1, 2, 4, 8, 16, &c. where the common ratio is 2.

The general and common property of a geometrical progression is, that the product of any two terms, or the square of any one single term, is equal to the product of every other two terms that are taken at an equal distance on both sides from the former. So of these terms,

1, 2, 4, 8, 16, 32, 64, &c.

$1 \times 64 = 2 \times 32 = 4 \times 16 = 8 \times 8 = 64.$

In any geometrical progression, if
a denote the least term,
z the greatest term,
r the common ratio,
n the number of the terms,
s the sum of the series, or all the terms;
then any of these quantities may be found from the others, by means of these general values, or equations, viz.

$$r = \sqrt[n-1]{\frac{z}{a}},$$

$$z = a \times r^{n-1},$$

$$a = z \div r^{n-1},$$

$$n = \frac{\log. \frac{rz}{a}}{\log. r} = \frac{\log. r + \log. z - \log. a}{\log. r},$$

$$s = \frac{r^n - 1}{r - 1} \times a = \frac{r^n - 1}{r - 1} \times \frac{z}{r^{n-1}} = \frac{rz - a}{r - 1} =$$

$$\frac{z^{\frac{n}{n-1}} - a^{\frac{n}{n-1}}}{z^{\frac{1}{n-1}} - a^{\frac{1}{n-1}}}.$$

When the series is infinite then the least term a is nothing, and the sum $s = \frac{rz}{r-1}$.

In any increasing geometrical progression, or series beginning with 1, the 3d, 5th, 7th, &c. terms will be squares; the 4th, 7th, 10th, &c. cubes; and the 7th will be both a square and a cube. Thus in the series 1, r, r^2, r^3, r^4, r^5, r^6, r^7, r^8, r^9, &c. r^2, r^4, r^6, r^8, are squares; r^3, r^6, r^9, cubes; and r^6 both a square and a cube.

Geometrical proportion, called also simply proportion, is the similitude or equality of ratios.

Thus, if $a : b :: c : d$, or $a : b = c : d$, the terms a, b, c, d, are in geometrical proportion; also 6, 3, 14. 7, are in geometrical proportion, because $6 : 3 :: 14 : 7$, or $6 : 3 = 14 : 7$. In a geometrical proportion, the product of the extremes, or 1st and 4th terms, is equal to the product of the means, or 2d and 3d terms. So $ad = bc$, and $6 \times 7 = 3 \times 14 = 42$.

GEOMETRICALLY. *ad.* (from *geometrical.*) According to the laws of geometry (*Ray*).

GEOMETRI'CIAN. *s.* (γεωμετρης.) One skilled in geometry; a geometer (*Brown*).

To GEO'METRIZE. *v. n.* (γεωμετρεω.) To act according to the laws of geometry (*Boyle*).

GEOMETRY, the science or doctrine of extension, or extended things; that is of lines, surfaces, or solids.

The word is Greek, γεωμετρια, formed of γεα, or γη, *earth;* and μετρεω, *measure;* it being the necessity of measuring the earth, and the parts and places thereof, that gave the first occasion to the invention of the principles and rules of this art; which has since been extended and applied to numerous other things; insomuch that geometry with arithmetic form now the general foundation of all mathematics.

Who were the first inventors of geometry is by no means certain. It is generally allowed that the Chaldeans were first possessed of the mathematical sciences, especially astronomy, which must imply geometry. Whether Abraham taught these sciences first to the Egyptians, when he went from Ur of the Chaldees, as some learned men assert, is not clear; but on this we may depend, that the Egyptians were the first people that cultivated geometry, being compelled thereto by necessity, the mother of inventions, in order to ascertain to every man his legal property and estate, in a country where boundaries and land-marks were swept away and confounded by yearly inundations.

That the Egyptians, in their ancient, free, monarchical state, were acquainted with some of the simple elements and easy problems in geometry, is not denied; but we cannot believe they made any great improvements in the abstruse parts thereof, since to Pythagoras (the famous philosopher of Samos, who flourished so low as about five hundred and twenty years before Christ, and who had

lived twenty-two years in Egypt) was attributed the invention of the thirty-second and forty-seventh propositions of the first of Euclid; for the latter of which he conceived so much joy, that he is said to have offered an hecatomb. A discovery of this kind, in later times, would have been entitled but to a small share of honour, and the want of knowing these propositions must needs make their geometry very coarse and imperfect. Upon this account, therefore, it may be concluded that the learning of the Egyptians, for which their priests were so famous, and Moses so celebrated in holy writ for having attained it, did not so much consist in mathematics, as in the arts of legislation, and civil polity, and magic. Their magicians, or wise men, thought that the sun, moon, stars, and elements, were appointed to govern the world; and though they acknowledged that God might, upon extraordinary occasions, work miracles, reveal his will by audible voices, divine appearances, dreams or prophecies, yet they thought also, that, generally speaking, oracles were given, prodigies caused, dreams of things to come occasioned by the disposition of the several parts of the universe to influence upon one another, at the proper places and seasons, as constantly and as necessarily as the heavenly bodies performed their revolutions; and they imagined that their learned professors, by a deep study of, and profound inquiry into, the powers of nature, could make themselves able to work wonders, obtain oracles and omens, and interpret dreams, either from fate (meaning the natural course of things), or from nature, which was when they used any artificial assistance by drinks, inebriations, discipline, or other means, which were thought to have a natural power to produce the vaticinal influence, or prophetic frenzy: and in all these particulars they thought the Deity not concerned, but that they were the mere natural effects of the influence of the elements and planets at set times and critical junctures.

From Egypt, geometry travelled into Greece; for Thales the Milesian, who flourished five hundred and eighty-four years before Christ, was the first of the Greeks who, coming into Egypt, transferred geometry from thence into Greece. He is reputed, certainly, besides other things, to have found out the fifth, fifteenth, and twenty-sixth propositions of Euclid's first book, and the second, third, fourth, and fifth of the fourth book. The same person improved astronomy, for he began to observe the equinoxes and solstices, and was the first who foretold an eclipse of the sun.

After him was Pythagoras, of Samos, before-mentioned. This man much improved and adorned the mathematic sciences, and so attached was he to arithmetic in particular, that almost his whole method of philosophizing was taken from numbers. He first of all abstracted geometry from matter, in which elevation of mind he found out several of Euclid's propositions. He first laid open the matter of incommensurable magnitudes, and the five regular bodies.

Next flourished Anaxagoras of Clazomenæ, and Œnopides of Chios. These were followed by Briso, Antipho, and Hippocrates, of Chios; which three, for attempting the quadrature of the circle, were reprehended by Aristotle, and, at the same time, celebrated. Then came Democritus, Theodorus, Cyrenæus, and Plato, than whom no one brought greater lustre to the mathematical sciences; he amplified geometry with great and notable additions, bestowing incredible study upon it, and above all, the art analytic, or of resolution, was found out by him; the most certain way of investigation and reasoning. Upon the door of his academy was read this inscription, μηδεὶς ἀγεωμέτρητος εἰσίτω. Thirteen of his familiar acquaintance are commemorated by Proclus, as men by whose studies the mathematics were improved. After these were Leon, and Eudoxus of Cnidos, a man great in arithmetic, and to whom we owe the whole fifth book of the elements; Xenocrates, and Aristotle. To Aristeus, Isidore, and Hypsicles, most subtile geometricians, we are indebted for the books of solids. Afterwards Euclid gathered together the inventions of others, disposed them into order, improved them, and demonstrated them more accurately, and left to us those Elements, by which youth is every where instructed in the mathematics. He died two hundred and eighty-four years before Christ. Almost an hundred years after followed Eratosthenes and Archimedes; the writings of the first are lost, but we have many remains of the latter. The very name of Archimedes suggests an idea of the top of human subtilty, and the perfection of the whole mathematical sciences; his wonderful inventions have been delivered to us by Polybius, Plutarch, Tzetres, and others. He was the first who was able to give the exact quadrature or mensuration of a space, bounded by the arch of a curve and a right line, which he did by demonstrating that the segment of a parabola is to its inscribed triangle as 4 : 3. Cotemporary with him was Conon; and at no great distance of time was Apollonius of Perga, another prince in geometry, called, by way of encomium, the great geometrician. We have extant four books of conics in his name; though some think Archimedes was the author of them: we have also three books of spherics by Theodosius the Tripolite. In the year seventy, after Christ, appeared Claudius Ptolemæus, the prince of astronomers, a man not only most skilful in astronomy, but in geometry also, as many other things by him written witness, but especially his books of subtenses. After these flourished Eutocius, Ctesibius, Proclus, Pappus, and Theon. Then ensued a long period of ignorance; arts and sciences, liberty and learning, being driven away and overrun by that brutish herd of northern barbarians, whose whole excellence was in their bones and muscles, and feats of chivalry their highest ambition. During this dismal night of ignorance, doubtless many curious discoveries and useful pieces of knowledge were totally lost, and the remainder buried, as it were, in ruins, till the restoration of learning upon the taking of Constantinople by the Turks in the year 1451 after Christ; whereby the residue of Greek and Roman learning was driven for refuge into Italy and the other neighbouring countries of Europe.

Geometry has always been valued for its extensive usefulness, but has been most admired for its true and real excellence, which consists in its perspicuity and perfect evidence. It may, therefore, be of use to consider the nature of the demonstrations, and the steps by which the ancients were able, in several instances, from the mensuration of right-lined figures, to judge of such as were bounded by curve lines; for as they did not allow themselves to resolve curvilinear figures into rectilinear elements, it is worth while to examine by what art they could make a transition from the one to the other.

They found that similar triangles are to each other in the duplicate ratio of their homologous sides; and by resolving similar polygons into similar triangles, the same proposition was extend-

ed to these polygons also. But when they came to compare curvilineal figures, which cannot be resolved into rectilineal parts, this method failed. Circles are the only curvilineal plain figures considered in the elements of geometry. If they could have allowed themselves to have considered these as similar polygons of an infinite number of sides, (as some have since done, who pretend to abridge their demonstrations,) after proving that any similar polygons inscribed in circles are in the duplicate ratio of their diameters, they would have immediately extended this to the circles themselves, and would have considered 2 Euc. 12. as an easy corollary from the first: but there is reason to think they would not have admitted a demonstration of this kind, for the old writers were very careful to admit no precarious principles, or aught else but a few self-evident truths, and no demonstrations but such as were accurately deduced from them. It was a fundamental principle with them, that the difference of any two unequal quantities, by which the greater exceeds the lesser, may be added to itself till it shall exceed any proposed finite quantity of the same kind: and that they founded their propositions concerning curvilineal figures upon this principle, in a particular manner, is evident from the demonstrations, and from the express declaration of Archimedes, who acknowledges it to be a foundation upon which he established his own discourses, and cites it as assumed by the ancients in demonstrating all the propositions of this kind: but this principle seems to be inconsistent with the admitting of an infinitely little quantity or difference, which, added to itself any number of times, is never supposed to become equal to any finite quantity soever.

They proceeded, therefore, in another manner, less direct indeed, but perfectly evident. They found that the inscribed similar polygons, by having the number of their sides increased, continually approached to the areas of the circles; so that the decreasing difference between each circle and its inscribed polygon, by still further and further divisions of the circular arches, which the sides of the polygon subtend, could become less than any quantity could be assigned; and that all this while the similar polygons observed the same constant invariable proportions to each other, viz. that of the squares of the diameters of the circles. Upon this they founded a demonstration, that the proportion of the circles themselves could be no other than that same invariable ratio of the similar inscribed polygons. For they proved, by the doctrine of proportions only, that the ratio of the two inscribed polygons cannot be the same as the ratio of one of the circles to a magnitude less than the other, nor the same as the ratio of one of the circles to a magnitude greater than the other; therefore the ratio of the circles to each other, must be the same as the invariable ratio of the similar polygons inscribed in them, which is the duplicate of the ratio of the diameters.

In the same manner the ancients have demonstrated, that pyramids of the same height are to each other as their bases, that spheres are as the cubes of their diameters, and that a cone is the one third part of a cylinder on the same base, and of the same height. In general, it appears from their way of demonstration, that when two variable quantities, which always have an invariable ratio to each other, approach at the same time to two determined quantities, so that they may differ less from them than by any assignable measure; the ratio of these limits or determined quantities must be the same as the invariable ratio of the two variable quantities: and this may be considered as the most simple and fundamental proposition in this doctrine, by which we are enabled to compare curvilineal spaces in some of the more simple cases.

The next improvement in the way of demonstrating among the ancient geometricians, seems to be that which we call the method of exhaustions. See EXHAUSTIONS.

Archimedes, indeed, takes a rather different way for comparing the spheroid with the cone and cylinder, that is more general, and has a nearer analogy to the modern methods. He supposes the terms of a progression to increase constantly by the same difference, and demonstrates several properties of such a progression relating to the sum of the terms, and the sum of their squares; by which he is able to compare the parabolic conoid, the spheroid, and hyperbolic conoid, with the cone; and the area of his spiral line with the area of the circle. There is an analogy betwixt what he has shewn of these progressions, and the proportions of figures demonstrated in the elementary geometry; the consequence of which may illustrate his doctrine, and serve, perhaps, to shew that it is more regular and complete in its kind than some have imagined. The relation of the sum of the terms to the quantity that arises by taking the greatest of them as often as there are terms, is illustrated by comparing the triangle with a parallelogram of the same height and base; and what he has demonstrated of the sum of the squares of the terms compared with the square of the greatest term may be illustrated by the proportion of the pyramid to the prism, or of the cone to the cylinder, their bases and heights being equal; and by the ratios of certain frustums or proportions of these solids deduced from the elementary proportions.

He appears solicitous, that his demonstrations should be found to depend on those principles only that had been universally received before his time. In his treatise of the quadrature of the parabola, he mentions a progression, whose terms decrease constantly in the proportion of four to one; but he does not suppose this progression to be continued to infinity or mention the sum of an infinite number of terms; though it is manifest, that all which can be understood by those who assign that sum was fully known to him. He appears to have been more fond of preserving to the science all its accuracy and evidence, than of advancing paradoxes; and contents himself with demonstrating this plain property of such a progression, that the sum of the terms continued at pleasure, added to the third part of the last term, amounts always to $\frac{4}{3}$ of the first term: nor does he suppose the chords of the curve to be bisected to infinity; so that after an infinite bisection, the inscribed polygon might be said to coincide with the parabola. These suppositions would have been new to the geometricians in his time, and such he appears to have carefully avoided.

This is a summary account of the progress that was made by the ancients in measuring and comparing curvilineal figures, and of the method by which they demonstrated their theorems of this kind. It is often said, that curve lines have been considered by them as polygons of an infinite number of sides; but this principle no where appears in their writings: we never find them resolving any figure or solid into infinitely small elements: on the contrary, they seem to have

avoided such suppositions, as if they judged them unfit to be received into geometry, when it was obvious, that their demonstrations might have been sometimes abridged by admitting them. They considered curvilineal areas as the limits of circumscribed or inscribed figures, of a more simple kind, which approach to these limits (by a bisection of lines or angles, continued at pleasure) so that the difference between them may become less than any given quantity. The inscribed or circumscribed figures were always conceived to be of a magnitude and number that is assignable; and from what had been shown of these figures, they demonstrated the mensuration, or the proportions of the curvilineal limits themselves, by arguments *ab absurdo*. They had made frequent use of demonstrations of this kind from the beginning of the elements; and these are, in a particular manner, adapted for making a transition from right-lined figures, to such as are bounded by curve lines. By admitting them only, they established the more difficult and sublime part of their geometry, on the same foundation as the first elements of the science; nor could they have proposed to themselves a more perfect model.

But as these demonstrations, by determining distinctly all the several magnitudes and proportions of these inscribed and circumscribed figures, did frequently extend to very great lengths, other methods of demonstrating have been contrived by the moderns, whereby to avoid these circumstantial deductions. The first attempt of this kind known to us, was made by Lucas Valerius; but afterwards Cavalerius, an Italian, about the year one thousand six hundred and thirty-five, advanced his method of Indivisibles, in which he proposes, not only to abbreviate the ancient demonstrations, but to remove the indirect form of reasoning used by them, of proving the equality or proportion between lines and spaces, from the impossibility of their having any different relation; and to apply to these curved magnitudes the same direct kind of proof that was before applied to right-lined quantities.

This method of comparing magnitudes, invented by Cavalerius, supposes lines to be compounded of points, surfaces of lines, and solids of planes; or, to make use of his own description, surfaces are considered as cloth, consisting of parallel threads; and solids are considered as formed of parallel planes, as a book is composed of its leaves, with this restriction, that the threads or lines, of which surfaces are compounded, are not to be of any conceivable breadth, nor the leaves or planes of solids of any thickness. He then forms these propositions, that surfaces are to each other, as all the lines in one to all the lines in the other; and solids, in like manner, in the proportion of all the planes.

This method exceedingly shortened the former tedious demonstrations, and was easily perceived; so that problems, which at first sight appeared of an insuperable difficulty, were afterwards resolved, and came, at length, to be despised, as too simple and easy: the mensuration of parabolas, hyperbolas, spirals of all the higher orders, and the famous cycloid, were among the early productions of this period. The discoveries made by Torricelli, de Fermat, de Roberval, Gregory St. Vincent, &c. are well known. They who have not read many authors, may find a synopsis of this method in Ward's Young Mathematician's Guide, where he treats of the mensuration of superficies and solids.

Notwithstanding, as this method is here explained, it is manifestly founded on inconsistent and impossible suppositions; for while the lines, of which surfaces are supposed to be made up, are real lines of no breadth, it is obvious, that no number whatever of them can form the least imaginable surface: if they are supposed to be of some sensible breadth, in order to be capable of filling up spaces, *i. e.* in reality to be parallelograms, how minute soever be their altitude, the surfaces may not be to each other in the proportion of all such lines in one to all the like lines in the other; for surfaces are not always in the same proportion to each other with the parallelograms inscribing them.

The same contradictory suppositions obviously attend the composition of solids by parallel planes, or of lines by such imaginary points.

This heterogeneous composition of quantity, and confusion of its species, so different from that distinctness, for which the mathematics were ever famous, was opposed at its first appearance by several eminent geometricians: particularly by Guldinus and Tacquet; who not only excepted to the first principles of this method, but taxed the conclusions formed upon it as erroneous. But as Cavalerius took care that the threads or lines of which the surfaces to be compared together were formed, should have the same breadth in each (as he himself expresses it) the conclusions deduced by his method might generally be verified by sounder geometry; since the comparison of these lines was, in effect, the comparing together the inscribed figures.

As in the application of this method, error, by proper caution, might be avoided, the assistance it seemed to promise in the analytical part of geometry made it eagerly followed by those who were more desirous to discover new propositions, than solicitous about the elegance or propriety of their demonstrations. Yet so strange did the contradictory conception appear, of composing surfaces out of lines, and solids out of planes, that, in a short time, it was new modelled into that form, which it still retains, and which now universally prevails among the foreign mathematicians, under the name of the differential method, or the analysis of infinitely littles.

In this reformed notion of indivisibles, surfaces are now supposed as composed not of lines but of parallelograms, having infinitely little breadths; and solids, in like manner as formed of prisms, having infinitely little altitudes. By this alteration it was imagined, that the heterogeneous composition of Cavalerius was sufficiently evaded, and all the advantages of his method retained. But here, again, the same absurdity occurs as before; for if, by the infinitely little breadth of these parallelograms, we are to understand what these words literally import, i. e. no breadth at all; then they cannot, any more than the lines of Cavalerius, compose a surface; and if they have any breadth, the right lines bounding them cannot coincide with a surface bounded by a curve line.

The followers of this new method grew bolder than the disciples of Cavalerius, and having transformed his points, lines, and planes, into infinitely little lines, surfaces, and solids, they pretended they no longer compared together heterogeneous quantities, and insisted on their principles, being now become genuine; but the mistakes they frequently fell into were a sufficient confutation of their boasts; for notwithstanding this new model, the same limitations and cautions were still ne-

cessary: for instance, this agreement between the inscribing figures and the curved spaces to which they are adapted, is only partial; and in applying their principles to propositions already determined by a juster method of reasoning, they easily perceived this defect; both in surfaces and solids, it was evident, at first view, that the perimeters disagreed. And as no one instance can be given, where these indivisible or infinitely little parts do so completely coincide with the quantities they are supposed to compound, as in every circumstance to be taken for them, without producing erroneous conclusions, so we find, where a surer guide was wanting, or disregarded, these figures were often imagined to agree, where they ought to have been supposed to differ.

Leibnitz, in two dissertations, one on the resistance of fluids, the other on the motion of the heavenly bodies, has, on this principle, reasoned falsely concerning the lines intercepted between curves and their tangents. Bernoulli has, likewise, made the same mistake in a dissertation on the resistance of fluids, and in a pretended solution of the problem concerning isoperimetrical curves. Nay, Mr. Parent has had the rashness to oppose erroneous deductions from this absurd principle, to the most indubitable demonstrations of the great Huygens. Thus it appears, that the doctrine of indivisibles contains an erroneous method of reasoning, and, in consequence thereof, in every new subject to which it shall be applied, is liable to fresh errors.

It is also manifest, that the great brevity it gave to demonstrations, arose entirely from the absurd attempt of comparing curvilineal spaces in the same direct manner as right line figures can be compared; for, in order to conclude directly the equality or proportion of such spaces, no scruple was made of supposing, contrary to truth, that rectilineal figures, capable of such direct comparison, could adequately fill up the spaces in question; whereas, the doctrine of exhaustions does not attempt, from the equality or proportion of the inscribing or circumscribing figures, to conclude, directly, the like proportions of these spaces, because those figures can never, in reality, be made equal to the spaces they are adapted to: but as these figures may be made to differ from the spaces to which they are adapted, by less than any space proposed, how minute soever, it shews by a just, though indirect deduction from these circumscribing and inscribing figures, that the spaces whose equality is to be proved, can have no difference; and that the spaces, whose proportion is to be shewn, cannot have a different proportion than that assigned them.

The Arithmetica Infinitorum of Dr. Wallis was the fullest treatise of this kind that appeared before the invention of fluxions. Archimedes had considered the sums of the terms in an arithmetical progression, and of their squares only, (or rather the limits of these sums only) these being sufficient for the mensuration of the figures he had examined. Dr. Wallis treats this subject in a very general manner, and assigns like limits for the sums of any powers of the terms, whether the exponents be integers or fractions, positive or negative. Having discovered one general theorem that includes all of this kind, he then composed new progressions from various aggregates of these terms, and enquired into the sums of the powers of these terms, by which he was enabled to measure accurately, or by approximation, the areas of figures without number: but he composed this treatise (as he tells us), before he had examined the writings of Archimedes; and he proposes his theorems and demonstrations in a less accurate form: he supposes the progressions to be continued to infinity, and investigates, by a kind of induction, the proportion of the sum of the powers, to the production that would arise by taking the greatest power as often as there are terms. His demonstrations, and some of his expressions, (as when he speaks of quantities more than infinite) have been excepted against; however, it must be owned, this valuable treatise contributed to produce the great improvements which soon after followed.

The next promoter of geometry, with respect to time, among our countrymen, was Dr. Barrow, a man of a penetrating genius, and very indefatigable: he had amassed a large magazine of learning; and his general character was, that whatever subject he treated he exhausted: he was a perfect master of the ancient geometry; and has obliged us with compendious, yet clear demonstrations of what is left of the geometrical writings of Euclid, Archimedes, Apollonius, and Theodosius. But the advances he made in curvelined geometry, his own particular improvements, are contained in his lectures. He begins with treating on the generation of magnitude, which comprehends the original of mathematical hypotheses. Magnitude may be produced various ways, or conceived so to be; but the primary and chief among them is that performed by local motion, which all of them must in some sort suppose; because, without motion, nothing can be generated or produced: so true is Aristotle's axiom, viz. he that is ignorant of motion, is necessarily ignorant of nature. What mathematicians chiefly consider in motion, are these two properties, viz. the mode of lation or manner of bearing; and the quantity of the motive force. From these springs the differences of motions flow; but because the quantity of motive force cannot be known without time, the doctor gives a long metaphysical account of the nature of time; which he defines to be, abstractedly, *the capacity or possibility of the continuance of any thing in its own being.* Towards the latter end of this he agrees with Aristotle, that we not only measure motion by time, but also time by motion; because they determine each other: for in like manner, as we first of all measure a space by some magnitude, and declare it is so much; and afterwards, by means of this space, compute other magnitudes correspondent with it: so we first assume time from some motion, and afterwards judge thence of other motions; which, in reality, is no more than comparing some motions with others, by the assistance of time; just as we investigate the ratios of magnitude by the help of some space. E. g. He who computes the proportion of motion by the proportion of time, does no more than get the said ratio of motions from clocks, dials, or from the proportion of solar motions in the same time. Again, because time is a quantity uniformly extended, all whose parts correspond, either proportionally to the respective parts of an equal motion, or to the parts of spaces moved through with an unequal motion; it may, therefore, be very aptly represented to our minds by any magnitude alike in all its parts; and especially the most simple ones, such as a straight or circular line; between which and time there happens to be much likeness and analogy: for as time consists of parts altogether similar, it is reasonable to consider it as a quantity endowed with one dimen-

tion only; whether we imagine it to be made up, as it were, either of the simple addition of rising moments, or of the continual flux of one moment; and for that reason ascribe only length to it, and determine its quantity by the length of a line passed over. As a line is looked on to be the trace of a point moving forward, being in some sort divisible by a point, and may be divided by motion one way, viz. as to length; so time may be conceived as the trace of a moment continually flowing; having some kind of divisibility from an instant, and from a successive flux, inasmuch as it can be divided some way or other. And like as the quantity of a line consists of but one length following a motion, so the quantity of time pursues but one succession stretched out, as it were, in length; which the length of the space moved over shews and determines. Time may, therefore, always be expressed by a right line; first, indeed; taken or laid down at pleasure; but whose parts will exactly answer to the proportionable parts of time, as its points do the respective instants of time, and will aptly serve to represent them.

The doctor next proceeds to the effective force of time, being the same as what he before called the motive force by which magnitudes are generated. He considers this as a kind of quantity, capable of computation, like other quantities: for it is plain from experience, that when two moveable bodies depart from the same place along the same line, the one moves a greater space than the other in the same time; the reason of which can only be this, that that body which moves swiftest, is acted upon by a greater force or motive power; this force, therefore, admitting of greater and less modifications, may be justly conceived as divisible into any infinite or indefinite parts; the least of which is called rest, or the lowest degree of velocity: considering, therefore, the thing absolutely, in order to represent the quantity of this force justly to the mind, we need only lay down some regular magnitude in its stead. As a right line is the most simple and perspicuous of any, it is, therefore, the fittest to represent any degree thereof. When this force comes under a mathematical consideration, it is called velocity; which is defined to be *that power by which a moveable body can pass over a given space in a given time*; whence it follows, that every particular quantity of any velocity cannot be known, neither by the space moved through only, nor by the time singly, but may be found by calculation from the quantity of space and time together; as, on the contrary, the quantity of time may be obtained from the quantity of the space and velocity together: nor does the quantity of space (so far as it can be known this way by motion) depend wholly upon the quantity of a definite velocity, or upon any assigned time, but upon the conjoint ratio of both. The quantity of space is found after the same manner as we do that of a superficies, by its dimensions; but the quantities of velocity and time are found exactly after the same manner as when a superficies and one of its dimensions are given, we thereby find the other: for to every moment of time there answers some degree of velocity, which a moveable body is then conceived to have; to which degree some length of the space moved over answers. When time flows equally, it will be most aptly represented by a right line; and the several degrees of velocity, whether equal or unequal, in each instant, may be also expressed by right lines; and because these degrees of velocity do in every moment of time pass over one another independently and without mixture; therefore, if right lines parallel to each other, and horizontal, be drawn through all the points of the perpendicular line representing the time, the plain superficies thence resulting, will exactly represent the aggregate of the degrees of velocity; which superficies, having its parts proportionable to the respective parts of the space moved through, may very well represent that space. If the velocities answering to each instant of time are equal, this superficies will be a parallelogram; if unequal, a triangle. From the properties of the former figure are deduced all the theorems of equable and uniform motion; and from the latter, all those which concern equally accelerated motion. Moreover, if the degrees of velocity, in a continual succession from rest, throughout every instant of time, to a given degree, be conceived to increase to it, or decrease from thence to rest in the progression of the square numbers, the aggregatical velocity, as well as the space moved through, may most conveniently be represented by the semiparabola, whose vertex denotes rest, the several equal parts of the absciss, the given equal times, and the ordinates, the respective degrees of velocity; from a well known property of the parabola. In like manner, any supposed degrees of velocity, any way increasing or decreasing continually, or interruptedly after any imaginable way, may be truly and conveniently expressed by right lines applied to that representing the time, keeping whatever proportion any one is pleased to assign; so that knowing from thence the representative space, the quantity of space moved through will be easily had, and the contrary; for it is easy to deduce theorems, if any one knows rightly and congruously how to reduce quantities of any kind soever, subject to his contemplation, to analogous magnitudes.

Perhaps this dry account of these metaphysical subjects may to some seem tedious; but if it be considered that hereupon are founded the theories of the descent of heavy bodies, of pendulums, and of projectiles, the reducing of which to geometrical demonstrations raised the famous Galileo to so high a reputation, that he was said to have added two new sciences to the mathematics; and when we further consider that the doctrine of fluxions is comprised in two mechanical problems, and that mechanics, or the doctrine of motion, depends upon computation of the quantities of time, velocities, and forces; it will then appear that these considerations directly lead towards fluxions, and that it cannot be time ill-spent to consider their nature abstractedly; unless we could be content to know the manner of operating by them only, without contemplating the reason of them in theory, and knowing whether they are really scientific or not. See FLUXIONS, INDIVISIBLES, &c.

For a catalogue of the principal writers, ancient and modern, we must refer the reader to the article Geometry in Dr. Hutton's Mathematical Dictionary.

Geometry is distinguished into theoretical or speculative, and practical.

Theoretical or *Speculative Geometry*, treats of the various properties and relations in magnitudes, demonstrating the theorems, &c. And

Practical Geometry, is that which applies those speculations and theorems to particular uses in the solution of problems, and in the measurements in the ordinary concerns of life.

Speculative geometry again may be divided into elementary and sublime.

GEOMETRY.

Elementary or *Common Geometry*, is that which is employed in the consideration of right lines and plane surfaces, with the solids generated from them. And the

Higher or *Sublime Geometry*, is that which is employed in the consideration of curve lines, conic sections, and the bodies formed of them. This part has been chiefly cultivated by the moderns, by help of the improved state of algebra, and the modern analysis or fluxions.

The standard author on the elements of geometry is Euclid. See EUCLID and ELEMENTS. The definitions and propositions of his first six, and eleventh and twelfth books, are as below.

Book I. Def. 1.—A point is that which hath no magnitude.

2. A line is length without breadth.

3. The extremities of a line are points.

4. A straight line is that which lies evenly between its extreme points.

5. A superficies is that which hath only length and breadth.

6. The extremities of a superficies are lines.

7. A plane superficies is that in which any two points being taken, the straight line between them lies wholly in that superficies.

8. "A plane angle is the inclination of two lines to one another in a plane, which meet together, but are not in the same direction."

9. A plane rectilineal angle is the inclination of two straight lines to one another, which meet together, but are not in the same straight line.

10. When a straight line standing on another straight line makes the adjacent angles equal to one another, each of the angles is called a right angle; and the straight line which stands on the other is called a perpendicular to it.

11. An obtuse angle is that which is greater than a right angle.

12. An acute angle is that which is less than a right angle.

13. "A term or boundary is the extremity of any thing."

14. A figure is that which is inclosed by one or more boundaries.

15. A circle is a plane figure contained by one line, which is called the circumference, and is such that all straight lines drawn from a certain point within the figure to the circumference, are equal to one another.

16. And this point is called the centre of the circle.

17. A diameter of a circle is a straight line drawn through the centre, and terminated both ways by the circumference.

18. A semicircle is the figure contained by a diameter and the part of the circumference cut off by the diameter.

19. "A segment of a circle is the figure contained by a straight line, and the circumference it cuts off."

20. Rectilineal figures are those which are contained by straight lines.

21. Trilateral figures, or triangles, by three straight lines.

22. Quadrilateral, by four straight lines.

23. Multilateral figures, or polygons, by more than four straight lines.

24. Of three sided figures, an equilateral triangle is that which has three equal sides.

25. An isosceles triangle, is that which has only two sides equal.

26. A scalene triangle, is that which has three unequal sides.

27. A right angled triangle, is that which has a right angle.

28. An obtuse angled triangle, is that which has an obtuse angle.

29. An acute angled triangle, is that which has three acute angles.

30. Of four sided figures, a square is that which has all its sides equal, and all its angles right angles.

31. An oblong, is that which has all its angles right angles, but has not all its sides equal.

32. A rhombus, is that which has all its sides equal, but its angles are not right angles.

33. A rhomboid, is that which has its opposite sides equal to one another, but all its sides are not equal, nor its angles right angles.

34. All other four sided figures besides these, are called trapeziums.

35. Parallel straight lines, are such as are in the same plane, and which, being produced ever so far both ways, do not meet.

Postulates.—1. Let it be granted that a straight line may be drawn from any one point to any other point.

2. That a terminated straight line may be produced to any length in a straight line.

3. And that a circle may be described from any centre, at any distance from that centre.

Axioms.—1. Things which are equal to the same are equal to one another.

2. If equals be added to equals, the wholes are equal.

3. If equals be taken from equals, the remainders are equal.

4. If equals be added to unequals, the wholes are unequal.

5. If equals be taken from unequals, the remainders are unequal.

6. Things which are double of the same, are equal to one another.

7. Things which are halves of the same, are equal to one another.

8. Magnitudes which coincide with one another, that is, which exactly fill the same space, are equal to one another.

9. The whole is greater than its part.

10. Two straight lines cannot inclose a space.

11. All right angles are equal to one another.

12. "If a straight line meets two straight lines, so as to make the two interior angles on the same side of it taken together less than two right angles, these straight lines being continually produced, shall at length meet upon that side on which are the angles which are less than two right angles. See the notes on Prop. XXIX. of Book I."

Prop. I. Prob. To describe an equilateral triangle upon a given finite straight line.

Prop. II. Prob. From a given point to draw a straight line equal to a given straight line.

Prop. III. Prob. From the greater of two given straight lines to cut off a part equal to the less.

Prop. IV. Theor. If two triangles have two sides of the one equal to two sides of the other, each to each; and have likewise the angles contained by those sides equal to one another; they shall likewise have their bases, or third sides, equal; and the two triangles shall be equal; and their other angles shall be equal, each to each, viz. those to which the equal sides are opposite.

Prop. V. Theor. The angles at the base of an isosceles triangle are equal to one another; and if the equal sides be produced, the angles upon the other side of the base shall be equal.

Prop. VI. Theor. If two angles of a

equal to one another, the sides also which subtend, or are opposite to, the equal angles, shall be equal to one another.

Prop. VII. Theor. Upon the same base, and on the same side of it, there cannot be two triangles that have their sides which are terminated in one extremity of the base equal to one another, and likewise those which are terminated in the other extremity.

Prop. VIII. Theor. If two triangles have two sides of the one equal to two sides of the other, each to each, and have likewise their bases equal; the angle which is contained by the two sides of the one shall be equal to the angle contained by the two sides equal to them, of the other.

Prop. IX. Prob. To bisect a given rectilineal angle, that is, to divide it into two equal angles.

Prop. X. Prob. To bisect a given finite straight line, that is, to divide it into two equal parts.

Prop. XI. Prob. To draw a straight line at right angles to a given straight line, from a given point in the same.

Prop. XII. Prob. To draw a straight line perpendicular to a given straight line of an unlimited length, from a given point without it.

Prop. XIII. Theor. The angles which one straight line makes with another upon the one side of it, are either two right angles, or are together equal to two right angles.

Prop. XIV. Theor. If, at a point in a straight line, two other straight lines, upon the opposite sides of it, make the adjacent angles together equal to two right angles, these two straight lines shall be in one and the same straight line.

Prop. XV. Theor. If two straight lines cut one another, the vertical, or opposite, angles shall be equal.

Prop. XVI. Theor. If one side of a triangle be produced, the exterior angle is greater than either of the interior opposite angles.

Prop. XVII. Theor. Any two angles of a triangle are together less than two right angles.

Prop. XVIII. Theor. The greater side of every triangle is opposite to the greater angle.

Prop. XIX. Theor. The greater angle of every triangle is subtended by the greater side, or has the greater side opposite to it.

Prop. XX. Theor. Any two sides of a triangle are together greater than the third side.

Prop. XXI. Theor. If, from the ends of the side of a triangle, there be drawn two straight lines to a point within the triangle, these shall be less than the other two sides of the triangle, but shall contain a greater angle.

Prop. XXII. Prob. To make a triangle of which the sides shall be equal to three given straight lines, but any two whatever of these must be greater than the third.

Prop. XXIII. Prob. At a given point in a given straight line, to make a rectilineal angle equal to a given rectilineal angle.

Prop. XXIV. Theor. If two triangles have two sides of the one equal to two sides of the other, each to each, but the angle contained by the two sides of one of them greater than the angle contained by the two sides equal to them, of the other; the base of that which has the greater angle shall be greater than the base of the other.

Prop. XXV. Theor. If two triangles have two sides of the one equal to two sides of the other, each to each, but the base of the one greater than the base of the other; the angle also contained by the sides of that which has the greater base, shall be greater than the angle contained by the sides equal to them, of the other.

Prop. XXVI. Theor. If two triangles have two angles of one equal to two angles of the other, each to each; and one side equal to one side, viz. either the sides adjacent to the equal angles, or the sides opposite to equal angles in each; then shall the other sides be equal, each to each; and also the third angle of the one to the third angle of the other.

Prop. XXVII. Theor. If a straight line falling upon two other straight lines makes the alternate angles equal to one another, these two straight lines shall be parallel.

Prop. XXVIII. Theor. If a straight line falling upon two others traight lines makes the exterior angle equal to the interior and opposite upon the same side of the line; or makes the interior angles upon the same side together equal to two right angles; the two straight lines shall be parallel to one another.

Prop. XXIX. Theor. If a straight line fall upon two parallel straight lines, it makes the alternate angles equal to one another; and the exterior angle equal to the interior and opposite upon the same side; and likewise the two interior angles upon the same side together equal to two right angles.

Prop. XXX. Theor. Straight lines which are parallel to the same straight line are parallel to one another.

Prop. XXXI. Prob. To draw a straight line through a given point parallel to a given straight line.

Prop. XXXII. Theor. If a side of any triangle be produced, the exterior angle is equal to the two interior and opposite angles: and the three interior angles of every triangle are equal to two right angles.

Prop. XXXIII. Theor. The straight lines which join the extremities of two equal and parallel straight lines, towards the same parts, are also themselves equal and parallel.

Prop. XXXIV. Theor. The opposite sides and angles of parallelograms are equal to one another, and the diameter bisects them, that is, divides them in two equal parts.

Prop. XXXV. Theor. Parallelograms upon the same base and between the same parallels, are equal to one another.

Prop. XXXVI. Theor. Parallelograms upon equal bases, and between the same parallels, are equal to one another.

Prop. XXXVII. Theor. Triangles, upon the same base, and between the same parallels, are equal to one another.

Prop. XXXVIII. Theor. Triangles upon equal bases, and between the same parallels, are equal to one another.

Prop. XXXIX. Theor. Equal triangles upon the same base, and upon the same side of it, are between the same parallels.

Prop. XL. Theor. Equal triangles upon equal bases, in the same straight line, and towards the same parts, are between the same parallels.

Prop. XLI. Theor. If a parallelogram and triangle be upon the same base, and between the same parallels; the parallelogram shall be double of the triangle.

Prop. XLII. Prob. To describe a parallelogram that shall be equal to a given triangle, and have one of its angles equal to a given rectilineal angle.

Prop. XLIII. Theor. The complements of the parallelograms which are about the diameter of any parallelogram, are equal to one another.

Prop. XLIV. Prob. To a given straight line to apply a parallelogram, which shall be equal to a given triangle, and have one of its angles equal to a given rectilineal angle.

Prop. XLV. Prob. To describe a parallelogram equal to a given rectilineal figure, and having an angle equal to a given rectilineal angle.

Prop. XLVI. Prob. To describe a square upon a given straight line.

Prop. XLVII. Theor. In any right angled triangle, the square which is described upon the side subtending the right angle, is equal to the squares described upon the sides which contain the right angle.

Prop. XLVIII. Theor. If the square described upon one of the sides of a triangle, be equal to the squares described upon the other two sides of it; the angle contained by these two sides is a right angle.

Book II. Def. 1.—Every right angled parallelogram is said to be contained by any two of the straight lines which contain one of the right angles.

2. In every parallelogram, any of the parallelograms about a diameter, together with the two complements, is called a gnomon.

Prop. I. Theor. If there be two straight lines, one of which is divided into any number of parts; the rectangle contained by the two straight lines, is equal to the rectangles contained by the undivided line, and the several parts of the divided line.

Prop. II. Theor. If a straight line be divided into any two parts, the rectangles contained by the whole and each of the parts, are together equal to the square of the whole line.

Prop. III. Theor. If a straight line be divided into any two parts, the rectangle contained by the whole and one of the parts, is equal to the rectangle contained by the two parts, together with the square of the foresaid part.

Prop. IV. Theor. If a straight line be divided into any two parts, the square of the whole line is equal to the squares of the two parts, together with twice the rectangle contained by the parts.

Prop. V. Theor. If a straight line be divided into two equal parts, and also into two unequal parts; the rectangle contained by the unequal parts, together with the square of the line between the points of section, is equal to the square of half the line.

Prop. VI. Theor. If a straight line be bisected, and produced to any point; the rectangle contained by the whole line thus produced, and the part of it produced, together with the square of half the line bisected, is equal to the square of the straight line which is made up of the half and the part produced.

Prop. VII. Theor. If a straight line be divided into any two parts, the squares of the whole line, and of one of the parts, are equal to twice the rectangle contained by the whole and that part, together with the square of the other part.

Prop. VIII. Theor. If a straight line be divided into any two parts, four times the rectangle contained by the whole line, and one of the parts, together with the square of the other part, is equal to the square of the straight line which is made up of the whole and that part.

Prop. IX. Theor. If a straight line be divided into two equal, and also into two unequal parts; the squares of the two unequal parts are together double of the square of half the line, and of the square of the line between the points of section.

Prop. X. Theor. If a straight line be bisected, and produced to any point, the square of the whole line thus produced, and the square of the part of it produced, are together double of the square of half the line bisected, and of the square of the line made up of the half and the part produced.

Prop. XI. Prob. To divide a given straight line into two parts, so that the rectangle contained by the whole, and one of the parts, shall be equal to the square of the other part.

Prop. XII. Theor. In obtuse angled triangles, if a perpendicular be drawn from any of the acute angles to the opposite side produced, the square of the side subtending the obtuse angle is greater than the squares of the sides containing the obtuse angle, by twice the rectangle contained by the side upon which, when produced, the perpendicular falls, and the straight line intercepted without the triangle between the perpendicular and the obtuse angle.

Prop. XIII. Theor. In every triangle, the square of the side subtending any of the acute angles, is less than the squares of the sides containing that angle, by twice the rectangle contained by either of these sides, and the straight line intercepted between the perpendicular let fall upon it from the opposite angle, and the acute angle.

Prop. XIV. Prob. To describe a square that shall be equal to a given rectilineal figure.

Book III. Def. 1.—Equal circles are those of which the diameters are equal, or from the centres of which the straight lines to the circumferences are equal.

This is not a definition but a theorem, the truth of which is evident; for, if the circles be applied to one another, so that their centres coincide, the circles must likewise coincide, since the straight lines from the centres are equal.

2. A straight line is said to touch a circle, when it meets the circle, and being produced does not cut it.

3. Circles are said to touch one another, which meet, but do not cut one another.

4. Straight lines are said to be equally distant from the centre of a circle, when the perpendiculars drawn to them from the centre are equal.

5. And the straight line on which the greater perpendicular falls, is said to be farther from the centre.

6. A segment of a circle is the figure contained by a straight line and the circumference it cuts off.

7. The angle of a segment is that which is contained by the straight line and the circumference.

8. An angle in a segment is the angle contained by two straight lines drawn from any point in the circumference of the segment, to the extremities of the straight line which is the base of the segment.

9. And an angle is said to insist or stand upon the circumference intercepted between the straight lines that contain the angle.

10. The sector of a circle is the figure contained by two straight lines drawn from the centre, and the circumference between them.

11. Similar segments of a circle, are those in which the angles are equal, or which contain equal angles.

Prop. I. Prob. To find the centre of a given circle.

Prop. II. Theor. If any two points be taken in the circumference of a circle, the straight line which joins them shall fall within the circle.

Prop. III. Theor. If a straight line drawn through the centre of a circle bisect a straight line in it which does not pass through the centre, it shall cut it at right angles; and, if it cuts it at right angles, it shall bisect it.

Prop. IV. Theor. If in a circle two straight lines cut one another which do not both pass through the centre, they do not bisect each other.

Prop. V. Theor. If two circles cut one another, they shall not have the same centre.

Prop. VI. Theor. If two circles touch one another internally, they shall not have the same centre.

Prop. VII. Theor. If any point be taken in the diameter of a circle, which is not the centre, of all the straight lines which can be drawn from it to the circumference, the greatest is that in which the centre is, and the other part of that diameter is the least; and, of any others, that which is nearer to the line which passes through the centre is always greater than one more remote: and from the same point there can be drawn only two straight lines that are equal to one another, one upon each side of the shortest line.

Prop. VIII. Theor. If any point be taken without a circle, and straight lines be drawn from it to the circumference, whereof one passes through the centre; of those which fall upon the concave circumference, the greatest is that which passes through the centre; and of the rest, that which is nearer to that through the centre is always greater than the more remote: but of those which fall upon the convex circumference, the least is that between the point without the circle, and the diameter; and of the rest, that which is nearer to the least is always less than the more remote: and only two equal straight lines can be drawn from the point unto the circumference, one upon each side of the least.

Prop. IX. Prob. If a point be taken within a circle, from which there fall more than two equal straight lines to the circumference, that point is the centre of the circle.

Prop X. Theor. One circumference of a circle cannot cut another in more than two points.

Prop. XI. Theor. If two circles touch each other internally, the straight line which joins their centres being produced shall pass through the point of contact.

Prop. XII. Theor. If two circles touch each other externally, the straight line which joins their centres shall pass through the point of contact.

Prop. XIII. Theor. One circle cannot touch another in more points than one, whether it touches it on the inside or outside.

Prop. XIV. Theor. Equal straight lines in a circle are equally distant from the centre; and those which are equally distant from the centre, are equal to one another.

Prop. XV. Theor. The diameter is the greatest straight line in a circle; and, of all others, that which is nearer to the centre is always greater than one more remote; and the greater is nearer to the centre than the less.

Prop. XVI. Theor. The straight line drawn at right angles to the diameter of a circle, from the extremity of it, falls without the circle; and no straight line can be drawn between that straight line and the circumference from the extremity, so as not to cut the circle; or, which is the same hing, no straight line can make so great an acute angle with the diameter at its extremity, or so small an angle with the straight line which is at right angles to it, as not to cut the circle.

Prop. XVII. Prob. To draw a straight line from a given point, either without or in the circumference, which shall touch a given circle.

Prop. XVIII. Theor. If a straight line touches a circle, the straight line drawn from the centre to the point of contact, shall be perpendicular to the line touching the circle.

Prop. XIX. Theor. If a straight line touches a circle, and from the point of contact a straight line be drawn at right angles to the touching line, the centre of the circle shall be in that line.

Prop. XX. Theor. The angle at the centre of a circle is double of the angle at the circumference, upon the same base, that is, upon the same part of the circumference.

Prop. XXI. Theor. The angles in the same segment of a circle are equal to one another.

Prop. XXII. Theor. The opposite angles of any quadrilateral figure described in a circle, are together equal to two right angles.

Prop. XXIII. Theor. Upon the same straight line, and upon the same side of it, there cannot be two similar segments of circles, not coinciding with one another.

Prop. XXIV. Theor. Similar segments of circles upon equal straight lines, are equal to one another.

Prop. XXV. Prob. A segment of a circle being given, to describe the circle of which it is the segment.

Prop. XXVI. Theor. In equal circles, equal angles stand upon equal circumferences, whether they be at the centres or circumferences.

Prob. XXVII. Theor. In equal circles, the angles which stand upon equal circumferences are equal to one another, whether they be at the centres or circumferences.

Prop. XXVIII. Theor. In equal circles, equal straight lines cut off equal circumferences, the greater equal to the greater, and the less to the less.

Prop. XXIX. Theor. In equal circles equal circumferences are subtended by equal straight lines.

Prop. XXX. Prob. To bisect a given circumference, that is, to divide it into two equal parts.

Prop. XXXI. Theor. In a circle, the angle in a semicircle is a right angle; but the angle in a segment greater than a semicircle is less than a right angle; and the angle in a segment less than a semicircle is greater than a right angle.

Prop. XXXII. Theor. If a straight line touches a circle, and from the point of contact a straight line be drawn cutting the circle, the angles made by this line with the line touching the circle, shall be equal to angles which are in the alternate segments of the circle.

Prop. XXXIII. Prob. Upon a given straight line to describe a segment of a circle, containing an angle equal to a given rectilineal angle.

Prop. XXXIV. Prob. To cut off a segment from a given circle which shall contain an angle equal to a given rectilineal angle.

Prop. XXXV. Theor. If two straight lines within a circle cut one another, the rectangle contained by the segments of one of them is equal to the rectangle contained by the segments of the other.

Prop. XXXVI. Theor. If from any point without a circle two straight lines be drawn, one of which cuts the circle, and the other touches it; the rectangle contained by the whole line which

cuts the circle, and the part of it without the circle, shall be equal to the square of the line which touches it.

Prop. XXXVII. Theor. If from a point without a circle there be drawn two straight lines, one of which cuts the circle, and the other meets it; if the rectangle contained by the whole line which cuts the circle, and the part of it without the circle be equal to the square of the line which meets it, the line which meets shall touch the circle.

Book IV. Def. 1.—A rectilineal figure is said to be inscribed in another rectilineal figure, when all the angles of the inscribed figure are upon the side of the figure in which it is inscribed, each upon each.

2. In like manner, a figure is said to be described about another figure, when all the sides of the circumscribed figure pass through the angular points of the figure about which it is described, each through each.

3. A rectilineal figure is said to be inscribed in a circle, when all the angles of the inscribed figure are upon the circumference of the circle.

4. A rectilineal figure is said to be described about a circle, when each side of the circumscribed figure touches the circumference of the circle.

5. In like manner, a circle is said to be inscribed in a rectilineal figure, when the circumference of the circle touches each side of the figure.

6. A circle is said to be described about a rectilineal figure, when the circumference of the circle passes through all the angular points of the figure about which it is described.

7. A straight line is said to be placed in a circle, when the extremities of it are in the circumference of the circle.

Prop. I. Prob. In a given circle to place a straight line, equal to a given straight line not greater than the diameter of the circle.

Prop. II. Prob. In a given circle to inscribe a triangle equiangular to a given triangle.

Prop. III. Prob. About a given circle to describe a triangle equiangular to a given triangle.

Prop. IV. Prob. To inscribe a circle in a given triangle.

Prop. V. Prob. To describe a circle about a given triangle.

Prop. VI. Prob. To inscribe a square in a given circle.

Prop. VII. Prob. To describe a square about a given circle.

Prop. VIII. Prob. To inscribe a circle in a given square.

Prop. IX. Prob. To describe a circle about a given square.

Prop. X. Prob. To describe an isosceles triangle, having each of the angles at the base double of the third angle.

Prop. XI. Prob. To inscribe an equilateral and equiangular pentagon in a given circle.

Prop. XII. Prob. To describe an equilateral and equiangular pentagon about a given circle.

Prop. XIII. Prob. To inscribe a circle in a given equilateral and equiangular pentagon.

Prop. XIV. Prob. To describe a circle about a given equilateral and equiangular pentagon.

Prop. XV. Prob. To inscribe an equilateral and equiangular hexagon in a given circle.

Prop. XVI. Prob. To inscribe an equilateral and equiangular quindecagon in a given circle.

Book V. Def. 1.—A less magnitude is said to be a part of a greater magnitude, when the less measures the greater, that is, when the less is contained a certain number of times exactly in the greater.

2. A greater magnitude is said to be a multiple of a less, when the greater is measured by the less, that is, when the greater contains the less a certain number of times exactly.

3. Ratio is a mutual relation of two magnitudes of the same kind to one another, in respect of quantity.

4. Magnitudes are said to have a ratio to one another, when the less can be multiplied so as to exceed the other.

5. The first of four magnitudes is said to have the same ratio to the second, which the third has to the fourth, when any equimultiples whatsoever of the first and third being taken, and any equimultiples whatsoever of the second and fourth; if the multiple of the first be less than that of the second, the multiple of the third is also less than that of the fourth; or, if the multiple of the first be equal to that of the second, the multiple of the third is also equal to that of the fourth; or, if the multiple of the first be greater than that of the second, the multiple of the third is also greater than that of the fourth.

6. Magnitudes which have the same ratio are called proportionals. N. B. When four magnitudes are proportionals, it is usually expressed by saying, the first is to the second, as the third to the fourth.

7. When of the equimultiples of four magnitudes (taken as in the fifth definition) the multiple of the first is greater than that of the second, but the multiple of the third is not greater than the multiple of the fourth; then the first is said to have to the second a greater ratio than the third magnitude has to the fourth; and, on the contrary, the third is said to have to the fourth a less ratio than the first has to the second.

8. Analogy, or proportion, is the similitude of ratios.

9. Proportion consists in three terms at least.

10. When three magnitudes are proportionals, the first is said to have to the third the duplicate ratio of that which it has to the second.

11. When four magnitudes are continual proportionals, the first is said to have to the fourth the triplicate ratio of that which it has to the second, and so on, quadruplicate, &c. increasing the denomination still by unity, in any number of proportionals.

Definition A. to wit, of compound ratio.

When there are any number of magnitudes, of the same kind, the first is said to have to the last of them the ratio compounded of the ratio which the first has to the second, and of the ratio which the second has to the third, and of the ratio which the third has to the fourth, and so on unto the last magnitude.

For example, if A, B, C, D be four magnitudes of the same kind, the first A is said to have to the last D the ratio compounded of the ratio of A to B, and of the ratio of B to C, and of the ratio of C to D; or, the ratio of A to D is said to be compounded of the ratios of A to B, B to C, and C to D: and if A has to B the same ratio which E has to F; and B to C, the same ratio that G has to H; and C to D, the same that K has to L; then, by this definition, A is said to have to D the ratio compounded of ratios which are the same with the ratios of E to F, G to H, and K to L: and the same thing is to be understood when it is more briefly expressed, by saying A has to D the ratio compounded of the ratios of E to F, G to H, and K to L.

In like manner, the same things being supposed,

if M has to N the same ratio which A has to D; then, for shortness sake, M is said to have to N, the ratio compounded of the ratios of E to F, G to H, and K to L.

12. In proportionals, the antecedent terms are called homologous to one another, as also the consequents to one another.

Geometers make use of the following technical words to signify certain ways of changing either the order or magnitude of proportionals, so as that they continue still to be proportionals.

13. Permutando, or alternando, by permutation, or alternately; this word is used when there are four proportionals, and it is inferred, that the first has the same ratio to the third, which the second has to the fourth; or that the first is to the third, as the second to the fourth: as is shewn in the XVI. Prop. of this Book V.

14. Invertendo, by inversion: when there are four proportionals, and it is inferred, that the second is to the first, as the fourth to the third. Prop. B. Book V.

15. Componendo, by composition, when there are four proportionals, and it is inferred, that the first, together with the second, is to the second, as the third together with the fourth, is to the fourth. Prop. XVIII. Book V.

16. Dividendo, by division; when there are four proportionals, and it is inferred, that the excess of the first above the second, is to the second, as the excess of the third above the fourth, is to the fourth. Prop. XVII. Book V.

17. Convertendo, by conversion; when there are four proportionals, and it is inferred, that the first is to its excess above the second, as the third to its excess above the fourth. Prop. E. Book V.

18. Ex aequali (sc. distantia), or ex aequo, from equality of distance; when there is any number of magnitudes more than two, and as many others, so that they are proportionals when taken two and two of each rank, and it is inferred, that the first is to the last of the first rank of magnitudes, as the first is to the last of the others: of this there are the two following kinds, which arise from the different order in which the magnitudes are taken two and two.

19. Ex aequali, from equality; this term is used simply by itself, when the first magnitude is to the second of the first rank, as the first to the second of the other rank; and as the second is to the third of the first rank, so is the second to the third of the other; and so on in order, and the inference is as mentioned in the preceding definition; whence this is called ordinate proportion. It is demonstrated in Prop. XXII. Book V.

20. Ex aequali, in proportione perturbata, seu inordinata; from equality, in perturbate or disorderly proportion; this term is used when the first magnitude is to the second of the first rank, as the last but one is to the last of the second rank; and as the second is to the third of the first rank, so is the last but two to the last but one of the second rank; and as the third is to the fourth of the first rank, so is the third from the last to the last but two of the second rank: and so on in a cross order: and the inference is as in Def. 18. It is demonstrated in Prop. XXIII. Book V.

Axioms.—1. Equimultiples of the same, or of equal magnitudes, are equal to one another.

2. Those magnitudes of which the same, or equal magnitudes, are equimultiples, are equal to one another.

3. A multiple of a greater magnitude is greater than the same multiple of a less.

4. That magnitude of which a multiple is greater than the same multiple of another, is greater than that other magnitude.

Prop. I. Theor. If any number of magnitudes be equimultiples of as many, each of each; what multiple soever any one of them is of its part, the same multiple shall all the first magnitudes be of all the other.

Prop. II. Theor. If the first magnitude be the same multiple of the second that the third is of the fourth, and the fifth the same multiple of the second that the sixth is of the fourth; then shall the first together with the fifth be the same multiple of the second, that the third together with the sixth is of the fourth.

Prop. III. Theor. If the first be the same multiple of the second, which the third is of the fourth; and if of the first and third there be taken equimultiples, these shall be equimultiples, the one of the second, and the other of the fourth.

Prop. IV. Theor. If the first of four magnitudes has the same ratio to the second which the third has to the fourth; then any equimultiples whatever of the first and third shall have the same ratio to any equimultiples of the second and fourth, viz. the equimultiple of the first shall have the same ratio to that of the second, which the equimultiple of the third has to that of the fourth.

Prop. V. Theor. If one magnitude be the same multiple of another, which a magnitude taken from the first is of a magnitude taken from the other; the remainder shall be the same multiple of the remainder, that the whole is of the whole.

Prop. VI. Theor. If two magnitudes be equimultiples of two others, and if equimultiples of these be taken from the first two, the remainders are either equal to these others, or equimultiples of them.

Prop. A. Theor. If the first of four magnitudes has to the second, the same ratio which the third has to the fourth; then, if the first be greater than the second, the third is also greater than the fourth; and, if equal, equal; if less, less.

Prop. B. Theor. If four magnitudes are proportionals, they are proportionals also when taken inversely.

Prop. C. Theor. If the first be the same multiple of the second, or the same part of it, that the third is of the fourth; the first is to the second, as the third is to the fourth.

Prop. D. Theor. If the first be to the second as the third to the fourth, and if the first be a multiple, or part of the second; the third is the same multiple, or the same part of the fourth.

Prop. VII. Theor. Equal magnitudes have the same ratio to the same magnitude; and the same has the same ratio to equal magnitudes.

Prop. VIII. Theor. Of unequal magnitudes, the greater has a greater ratio to the same than the less has; and the same magnitude has a greater ratio to the less, than it has to the greater

Prop. IX. Theor. Magnitudes which have the same ratio to the same magnitude are equal to one another; and those to which the same magnitude has the same ratio are equal to one another.

Prop. X. Theor. That magnitude which has a greater ratio than another has unto the same magnitude is the greater of the two: and that magnitude to which the same has a greater ratio than it has unto another magnitude is the lesser of the two.

Prop. XI. Theor. Ratios that are the same to the same ratio, are the same to one another.

Prop. XII. Theor. If any number of magnitudes be proportionals, as one of the antecedents is to its consequent, so shall all the antecedents taken together be to all the consequents.

Prop. XIII. Theor. If the first has to the second the same ratio which the third has to the fourth, but the third to the fourth a greater ratio than the fifth has to the sixth; the first shall also have to the second a greater ratie than the fifth has to the sixth.

Prop. XIV. Theor. If the first has to the second, the same ratio which the third has to the fourth; then, if the first be greater than the third, the second shall be greater than the fourth; and if equal, equal: and if less, less.

Prop. XV. Theor. Magnitudes have the same ratio to one another which their equimultiples have.

Prop. XVI. Theor. If four magnitudes of the same kind be proportionals, they shall also be proportionals when taken alternately.

Prop. XVII. Theor. If magnitudes, taken jointly, be proportionals, they shall also be proportionals when taken separately; that is, if two magnitudes together have to one of them the same ratio which two others have to one of these, the remaining one of the first two shall have to the other the same ratio which the remaining one of the last two has to the other of these.

Prob. XVIII. Theor. If magnitudes, taken separately, be proportionals, they shall also be proportionals, when taken jointly, that is, if the first be to the second, as the third to the fourth, the first and second together shall be to the second, as the third and fourth together to the fourth.

Prop. XIX. Theor If a whole magnitude be to a whole, as a magnitude taken from the first, is to a magnitude taken from the other; the remainder shall be to the remainder, as the whole to the whole.

Prop. E. Theor. If four magnitudes be proportionals, they are also proportionals by conversion, that is, the first is to its excess above the second, as the third to its excess above the fourth.

Prop. XX. Theor. If there be three magnitudes, and other three, which, taken two and two, have the same ratio; if the first be greater than the third, the fourth shall be greater than the sixth; and if equal, equal; and if less, less.

Prop. XXI. Theor. If there be three magnitudes, and other three, which have the same ratio taken two and two, but in a cross order; if the first magnitude be greater than the third, the fourth shall be greater than the sixth; and if equal, equal; and if less, less.

Prop. XXII Theor. If there be any number of magnitudes, and as many others, which, taken two and two in order, have the same ratio; the first shall have to the last of the first magnitudes the same ratio which the first of the others has to the last. N. B. This is usually cited by the words "ex aequali," or "ex aequo."

Prop. XXIII. Theor. If there be any number of magnitudes, and as many others, which, taken two and two, in a cross order, have the same ratio; the first shall have to the last of the first magnitudes the same ratio which the first of the others has to the last. N. B. This is usually cited by the words, "ex aequali in proportione perturbata;" or "ex aequo perturbate."

Prop. XXIV. Theor. If the first has to the second the same ratio which the third has to the fourth; and the fifth to the second, the same ratio which the sixth has to the fourth; the first and fifth together shall have to the second, the same ratio which the third and sixth together have to the fourth.

Prop. XXV. Theor. If four magnitudes of the same kind are proportionals, the greatest and least of them together are greater than the other two together.

Prop. F. Theor. Ratios which are compounded of the same ratios, are the same with one another.

Prop. G. Theor. If several ratios be the same with several ratios, each to each; the ratio which is compounded of ratios which are the same with the first ratios, each to each, is the same with the ratio compounded of ratios which are the same with the other ratios, each to each.

Prop. H. Theor. If a ratio compounded of several ratios be the same with a ratio compounded of any other ratios, and if one of the first ratios, or a ratio compounded of any of the first, be the same with one of the last ratios, or with the ratio compounded of any of the last; then the ratio compounded of the remaining ratios of the first, or the remaining ratio of the first. if but one remain, is the same with the ratio compounded of those remaining of the last, or with the remaining ratio of the last.

Prop. K. Theor. If there be any number of ratios, and any number of other ratios such, that the ratio compounded of ratios which are the same with the first ratios, each to each, is the same with the ratio compounded of ratios which are the same each to each, with the last ratios; and if one of the first ratios, or the ratio which is compounded of ratios which are the same with several of the first ratios, each to each, be the same with one of the last ratios, or with the ratio compounded of ratios which are the same, each to each, with several of the last ratios: then the ratio compounded of ratios which are the same with the remaining ratios of the first, each to each, or the remaining ratio of the first, if but one remain; is the same with the ratio compounded of ratios which are the same with those remaining of the last, each to each, or with the remaining ratio of the last.

Book VI. Def. 1.—Similar rectilineal figures are those which have their several angles equal, each to each, and the sides about the equal angles proportionals.

2. Reciprocal figures, viz. triangles and parallelograms, are such as have their sides about two of their angles proportionals in such manner, that a side of the first figure is to a side of the other, as the remaining side of this other is to the remaining side of the first.

3. A straight line is said to be cut in extreme and mean ratio, when the whole is to the greater segment, as the greater segment is to the less.

4. The altitude of any figure is the straight line drawn from its vertex perpendicular to the base.

Prop. I. Theor. Triangles and parallelograms of the same altitude are one to another as their bases.

Prop. II. Theor. If a straight line be drawn parallel to one of the sides of a triangle, it shall cut the other sides, or those produced, proportionally: and if the sides, or the sides produced, be cut proportionally, the straight line which joins the points of section shall be parallel to the remaining side of the triangle.

Prop. III. Theor. If the angle of a triangle be

divided into two equal angles, by a straight line which also cuts the base; the segments of the base shall have the same ratio which the other sides of the triangle have to one another: and if the segments of the base have the same ratio which the other sides of the triangle have to one another, the straight line drawn from the vertex to the point of section, divides the vertical angle into two equal angles.

Prop. A. Theor. If the outward angle of a triangle made by producing one of its sides, be divided into two equal angles, by a straight line which also cuts the base produced; the segments between the dividing line and the extremities of the base have the same ratio which the other sides of the triangle have to one another: and if the segments of the base produced, have the same ratio which the other sides of the triangle have, the straight line drawn from the vertex to the point of section divides the outward angle of the triangle into two equal angles.

Prop. IV. Theor. The sides about the equal angles of equiangular triangles are proportionals; and those which are opposite to the equal angles are homologous sides, that is, are the antecedents or consequents of the ratios.

Prop. V. Theor. If the sides of two triangles, about each of their angles, be proportionals, the triangles shall be equiangular, and have their equal angles opposite to the homologous sides.

Prop. VI. Theor. If two triangles have one angle of the one equal to one angle of the other, and the sides about the equal angles proportionals, the triangles shall be equiangular, and shall have those angles equal which are opposite to the homologous sides.

Prop. VII. Theor. If two triangles have one angle of the one equal to one angle of the other, and the sides about two other angles, proportionals, then, if each of the remaining angles be either less, or not less, than a right angle; or if one of them be a right angle: the triangles shall be equiangular, and have those angles equal about which the sides are proportionals.

Prop. VIII. Theor. In a right angled triangle, if a perpendicular be drawn from the right angle to the base; the triangles on each side of it are similar to the whole triangle, and to one another.

Prop. IX. Prob. From a given strait line to cut off any part required.

Prop. X. Prob. To divide a given straight line similarly to a given divided straight line, that is, into parts that shall have the same ratios to one another which the parts of the divided given straight line have.

Prob. XI. Prob. To find a third proportional to two given straight lines.

Prop. XII. Prob. To find a fourth proportional to three given straight lines.

Prop. XIII. Prob. To find a mean proportional between two given straight lines.

Prop. XIV. Theor. Equal parallelograms which have one angle of the one equal to one angle of the other, have their sides about the equal angles reciprocally proportional: and parallelograms that have one angle of the one equal to one angle of the other, and their sides about the equal angles reciprocally proportional, are equal to one another.

Prop. XV. Theor. Equal triangles which have one angle of the one equal to one angle of the other, have their sides about the equal angles reciprocally proportional: and triangles which have one angle in the one equal to one angle in the other, and their sides about the equal angles reciprocally proportional, are equal to one another.

Prop. XVI Theor. If four straight lines be proportionals, the rectangle contained by the extremes is equal to the rectangle contained by the means: and if the rectangle contained by the extremes be equal to the rectangle contained by the means, the four straight lines are proportionals.

Prop. XVII. Theor. If three straight lines be proportionals, the rectangle contained by the extremes is equal to the square of the mean: and if the rectangle contained by the extremes be equal to the square of the mean, the three straight lines are proportionals.

Prop. XVIII. Prob. Upon a given straight line to descr be a rectilineal figure similar, and similarly situated to a given rectilineal figure.

Prop. XIX. Theor. Similar triangles are to one another in the duplicate ratio of their homologous sides.

Prop. XX. Theor. Similar polygons may be divided into the same number of similar triangles, having the same ratio to one another that the polygons have; and the polygons have to one another the duplicate ratio of that which their homologous sides have.

Prop. XXI. Theor. Rectilineal figures which are similar to the same rectilineal figure, are also similar to one another.

Prop. XXII. Theor. If four straight lines be proportionals, the similar rectilineal figures similarly described upon them shall also be proportionals; and if the similar rectilineal figures similarly described upon four straight lines be proportionals, those straight lines shall be proportionals.

Prop. XXIII. Theor. Equiangular parallelograms have to one another the ratio which is compounded of the ratios of their sides.

Prop. XXIV. Theor. The parallelograms about the diameter of any parallelogram, are similar to the whole, and to one another.

Prop. XXV. Prob. To describe a rectilineal figure which shall be similar to one, and equal to another given rectilineal figure.

Prop. XXVI. Theor. If two similar parallelograms have a common angle, and be similarly situated; they are about the same diameter.

Prop. XXVII. Theor. Of all parallelograms applied to the same straight line, and deficient by parallelograms, similar and similarly situated to that which is described upon the half of the line; that which is applied to the half, and is similar to its defect, is the greatest.

Prop. XXVIII. Prob. To a given straight line to apply a parallelogram equal to a given rectilineal figure, and deficient by a parallelogram similar to a given parallelogram: but the given rectilineal figure to which the parallelogram to be applied is to be equal, must not be greater than the parallelogram applied to half of the given line, having its defect similar to the defect of that which is to be applied; that is, to the given parallelogram.

Prop. XXIX. Prob. To a given straight line to apply a parallelogram equal to a given rectilineal figure, exceeding by a parallelogram similar to another given.

Prop. XXX. Prob. To cut a given straight line in extreme and mean ratio.

Prop. XXXI. Theor. In right angled triangles, the rectilineal figure described upon the side opposite to the right angle, is equal to the similar,

and similarly described figures upon the sides containing the right angle.

Prop. XXXII. Theor. If two triangles which have two sides of the one proportional to two sides of the other, be joined at one angle, so as to have their homologous sides parallel to one another; the remaining sides shall be in a straight line.

Prop. XXXIII. Theor. In equal circles, angles, whether at the centres or circumferences, have the same ratio which the circumferences on which they stand have to one another: so also have the sectors.

Prop. B. Theor. If an angle of a triangle be bisected by a straight line, which likewise cuts the base; the rectangle contained by the sides of the triangle is equal to the rectangle contained by the segments of the base, together with the square of the straight line bisecting the angle.

Prop. C. Theor. If from any angle of a triangle a straight line be drawn perpendicular to the base; the rectangle contained by the sides of the triangle is equal to the rectangle contained by the perpendicular and the diameter of the circle described about the triangle.

Prop. D. Theor. The rectangle contained by the diagonals of a quadrilateral inscribed in a circle, is equal to both the rectangles contained by its opposite sides.

Book XI. Def. 1.—A solid is that which hath length, breadth, and thickness.

2. That which bounds a solid is a superficies.

3. A straight line is perpendicular, or at right angles to a plane, when it makes right angles with every straight line meeting it in that plane.

4. A plane is perpendicular to a plane, when the straight lines drawn in one of the planes perpendicularly to the common section of the two planes, are perpendicular to the other plane.

5. The inclination of a straight line to a plane is the acute angle contained by that straight line, and another drawn from the point in which the first line meets the plane, to the point in which a perpendicular to the plane drawn from any point of the first line above the plane, meets the same plane.

6. The inclination of a plane to a plane is the acute angle contained by two straight lines drawn from any the same point of their common section at right angles to it, one upon one plane, and the other upon the other plane.

7. Two planes are said to have the same, or a like inclination to one another, which two other planes have, when the said angles of inclination are equal to one another.

8. Parallel planes are such which do not meet one another though produced.

9. A solid angle is that which is made by the meeting of more than two planes, which are not in the same plane, in one point.

10. The tenth definition is omitted for reasons given in the notes.

11. Similar solid figures are such as have all their solid angles equal, each to each, and which are contained by the same number of similar planes.

12. A pyramid is a solid figure contained by planes that are constituted betwixt one plane and one point above it in which they meet.

13. A prism is a solid figure contained by plane figures of which two that are opposite are equal, similar, and parallel to one another; and the others parallelograms.

14. A sphere is a solid figure described by the revolution of a semicircle about its diameter which remains unmoved.

15. The axis of a sphere is the fixed straight line about which the semicircle revolves.

16. The centre of a sphere is the same with that of the semicircle.

17. The diameter of a sphere is any straight line which passes through the centre, and is terminated both ways by the superficies of the sphere.

18. A cone is a solid figure described by the revolution of a right angled triangle about one of the sides containing the right angle, which side remains fixed.

If the fixed side be equal to the other side containing the right angle, the cone is called a right angled cone; if it be less than the other side, an obtuse angled, and if greater, an acute angled cone.

19. The axis of a cone is the fixed straight line about which the triangle revolves.

20. The base of a cone is the circle described by that side containing the right angle, which revolves.

21. A cylinder is a solid figure described by the revolution of a right angled parallelogram about one of its sides which remains fixed.

22. The axis of a cylinder is the fixed straight line about which the parallelogram revolves.

23. The bases of a cylinder are the circles described by the two revolving opposite sides of the parallelogram.

24. Similar cones and cylinders are those which have their axes and the diameters of their bases proportionals.

25. A cube is a solid figure contained by six equal squares.

26. A tetrahedron is a solid figure contained by four equal and equilateral triangles.

27. An octahedron is a solid figure contained by eight equal and equilateral triangles.

28. A dodecahedron is a solid figure contained by twelve equal pentagons which are equilateral and equiangular.

29. An icosahedron is a solid figure contained by twenty equal and equilateral triangles.

Def. A. A parallelepiped is a solid figure contained by six quadrilateral figures, whereof every opposite two are parallel.

Prop. I. Theor. One part of a straight line cannot be in a plane and another part above it.

Prop. II. Theor. Two straight lines which cut one another are in one plane, and three straight lines which meet one another are in one plane.

Prop. III. Theor. If two planes cut one another, their common section is a straight line.

Prop. IV. Theor. If a straight line stand at right angles to each of two straight lines in the point of their intersection, it shall also be at right angles to the plane which passes through them, that is, to the plane in which they are.

Prop. V. Theor. If three straight lines meet all in one point, and a straight line stands at right angles to each of them in that point; these three straight lines are in one and the same plane.

Prop. VI. Theor. If two straight lines be at right angles to the same plane, they shall be parallel to one another.

Prop. VII. Theor. If two straight lines be parallel, the straight line drawn from any point in the one to any point in the other, is in the same plane with the parallels.

Prop. VIII. Theor. If two straight lines be parallel, and one of them is at right angles to a plane;

the other also shall be at right angles to the same plane.

Prop. IX. Theor. Two straight lines which are each of them parallel to the same straight line, and not in the same plane with it, are parallel to one another.

Prop. X. Theor. *If two straight lines meeting one another be parallel to two others that meet* one another, and are not in the same plane with the first two; the first two and the other two shall contain equal angles.

Prop. XI. Prob. To draw a straight line perpendicular to a plane, from a given point above it.

Prop. XII. Prob. To erect a straight line at right angles to a given plane, from a point given in the plane.

Prop. XIII. Theor. From the same point in a given plane, there cannot be two straight lines at right angles to the plane, upon the same side of it: and there can be but one perpendicular to a plane from a point above the plane.

Prop. XIV. Theor. Planes to which the same straight line is perpendicular, are parallel to one another.

Prop. XV. Theor. If two straight lines meeting one another, be parallel to two straight lines which meet one another, but are not in the same plane with the first two; the plane which passes through these is parallel to the plane passing through the others.

Prop. XVI. Theor. If two parallel planes be cut by another plane, their common sections with it are parallels.

Prop. XVII. Theor. If two straight lines be cut by parallel planes, they shall be cut in the same ratio.

Prop. XVIII. Theor. If a straight line be at right angles to a plane, every plane which passes through it shall be at right angles to that plane.

Prop. XIX. Theor. If two planes cutting one another be each of them perpendicular to a third plane; their common section shall be perpendicular to the same plane.

Prop. XX. Theor. If a solid angle be contained by three plane angles, any two of them are greater than the third.

Prop. XXI. Theor. Every solid angle is contained by plain angles which together are less than four right angles.

Prop. XXII. Theor. If every two of three plain angles be greater than the third, and if the straight lines which contain them be all equal; a triangle may be made of the straight lines that join the extremities of those equal straight lines.

Prop. XXIII. Prob. To make a solid angle which shall be contained by three given plane angles, any two of them being greater than the third, and all three together less than four right angles.

Prop. A. Theor. If each of two solid angles be contained by three plane angles equal to one another, each to each; the planes in which the equal angles are, have the same inclination to one another.

Prop. B. Theor. If two solid angles be contained, each by three plane angles which are equal to one another, each to each, and alike situated; these solid angles are equal to one another.

Prop. C. Theor. Solid figures contained by the same number of equal and similar planes alike situated, and having none of their solid angles contained by more than three plane angles, are equal and similar to one another.

Prop. XXIV. Theor. If a solid be contained by six planes, two and two of which are parallel; the opposite planes are similar and equal parallelograms.

Prop. XXV. Theor. If a solid parallelepiped be cut by a plane parallel to two of its opposite planes; it divides the whole into two solids, the base of one of which shall be to the base of the other, as the one solid is to the other.

Prop. XXVI. Prob. At a given point in a given straight line, to make a solid angle equal to a given solid angle contained by three plane angles.

Prop. XXVII. Prob. To describe from a given straight line a solid parallelepiped similar, and similarly situated to one given.

Prop. XXVIII. Theor. If a solid parallelepiped be cut by a plane passing through the diagonals of two of the opposite planes; it shall be cut in two equal parts.

Prop. XXIX. Theor. Solid parallelepipeds upon the same base, and of the same altitude, the insisting straight lines of which are terminated in the same straight lines in the plane opposite to the base, are equal to one another.

Prop. XXX. Theor. Solid parallelepipeds upon the same base, and of the same altitude, the insisting straight lines of which are not terminated in the same straight lines in the plane opposite to the base, are equal to one another.

Prop. XXXI. Theor. Solid parallelepipeds which are upon equal bases, and of the same altitude, are equal to one another.

Prop. XXXII. Theor. Solid parallelepipeds which have the same altitude, are to one another as their bases.

Prop. XXXIII. Theor. Similar solid parallelepipeds are one to another in the triplicate ratio of their homologous sides.

Prop. D. Theor. Solid parallelepipeds contained by parallelograms equiangular to one another, each to each, that is, of which the solid angles are equal, each to each, have to one another the ratio which is the same with the ratio compounded of the ratios of their sides.

Prop. XXXIV. Theor. The bases and altitudes of equal solid parallelepipeds, are reciprocally proportional; and if the bases and altitudes be reciprocally proportional, the solid parallelepipeds are equal.

Prop. XXXV. Theor. If, from the vertices of two equal plane angles, there be drawn two straight lines elevated above the planes in which the angles are, and containing equal angles with the sides of those angles, each to each; and if in the lines above the planes there be taken any points, and from them perpendiculars be drawn to the planes in which the first named angles are: and from the points in which they meet the planes, straight lines be drawn to the vertices of the angles first named; these straight lines shall contain equal angles with the straight lines which are above the planes of the angles.

Prop. XXXVI. Theor. If three straight lines be proportionals, the solid parallelepiped described from all three as its sides, is equal to the equilateral parallelepiped described from the mean proportional, one of the solid angles of which is contained by three plane angles equal, each to each, to the three plane angles containing one of the solid angles of the other figure.

Prop. XXXVII. Theor. If four straight lines be proportionals, the similar solid parallelepipeds similarly described from them shall also be proportionals. And if the similar parallelepipeds similarly described from four straight lines be proportionals, the straight lines shall be proportionals.

Prop. XXXVIII. Theor. If a plane be perpendicular to another plane, and a straight line be drawn from a point in one of the planes perpendicular to the other plane, this straight line shall fall on the common section of the planes.

Prop. XXXIX. Theor. In a solid parallelepiped, if the sides of two of the opposite planes be divided each into two equal parts, the common section of the planes passing through the points of division, and the diameter of the solid parallelepiped cut each other into two equal parts.

Prop. XL. Theor. If there be two triangular prisms of the same altitude, the base of one of which is a parallelogram, and the base of the other a triangle; if the parallelogram be double of the triangle, the prisms shall be equal to one another.

Book XII. Lemma 1 —Which is the first proposition of the tenth book, and is necessary to some of the propositions of this book.

If from the greater of two unequal magnitudes, there be taken more than its half, and from the remainder more than its half; and so on: there shall at length remain a magnitude less than the least of the proposed magnitudes.

Prop. I. Theor. Similar polygons inscribed in circles, are to one another as the squares of their diameters.

Prop. II. Theor. Circles are to one another as the squares of their diameters.

Prob. III. Theor. Every pyramid having a triangular base, may be divided into two equal and similar pyramids having triangular bases, and which are similar to the whole pyramid; and into two equal prisms which together are greater than half of the whole pyramid.

Prop. IV Theor. If there be two pyramids of the same altitude, upon triangular bases, and each of them be divided into two equal pyramids similar to the whole pyramid, and also into two equal prisms; and if each of these pyramids be divided in the same manner as the first two, and so on: as the base of one of the first two pyramids is to the base of the other, so shall all the prisms in one of them be to all the prisms in the other, that are produced by the same number of divisions.

Prop. V. Theor. Pyramids of the same altitude which have triangular bases, are to one another as their bases.

Prop. VI. Theor. Pyramids of the same altitude which have polygons for their bases, are to one another as their bases.

Prop. VII. Theor. Every prism having a triangular base may be divided into three pyramids that have triangular bases, and are equal to one another.

Prop. VIII. Theor. Similar pyramids having triangular bases are one to another in the triplicate ratio of that of their homologous sides.

Prop. IX. Theor. The bases and altitudes of equal pyramids having triangular bases are reciprocally proportional: and triangular pyramids of which the bases and altitudes are reciprocally proportional, are equal to one another.

Prop. X. Theor. Every cone is the third part of a cylinder which has the same base, and is of an equal altitude with it.

Prop. XI. Theor. Cones and cylinders of the same altitude, are to one another as their bases.

Prop. XII. Theor. Similar cones and cylinders have to one another the triplicate ratio of that which the diameters of their bases have.

Prop. XIII. Theor. If a cylinder be cut by a plane parallel to its opposite planes, or bases; it divides the cylinder into two cylinders, one of which is to the other as the axis of the first to the axis of the other.

Prop. XIV. Theor. Cones and cylinders upon equal bases are to one another as their altitudes.

Prop. XV. Theor. The bases and altitudes of equal cones and cylinders, are reciprocally proportional: and if the bases and altitudes be reciprocally proportional, the cones and cylinders are equal to one another.

Prop. XVI. Prob. To describe in the greater of two circles that have the same centre, a polygon of an even number of equal sides, that shall not meet the lesser circle.

Prop. XVII. Prob. To describe in the greater of two spheres which have the same centre, a solid polyhedron, the superficies of which shall not meet the lesser sphere.

Prop. XVIII. Theor. Spheres have to one another the triplicate ratio of that which their diameters have.

Geometry (Descriptive), the name given to a species of geometry almost entirely new, and which we owe in great measure to M. Monge.

When any surface whatever penetrates another, there most frequently results from their intersection curves of double curvature, the determination of which is necessary in many arts, as in groined vault-work, cutting arch-stones, wood-cutting, for ornamental work, &c. the form of which is frequently very fantastical and complicated: it is in the solution of problems appertaining to these subjects that descriptive geometry is especially useful.

Some architects more versed in geometry than persons of that profession commonly are, have long ago thrown some light on the first principles of this kind of geometry. There is, for example, a work by a jesuit named Father Courcier, who examined and shewed how to describe the curves resulting from the mutual penetration of cylindrical, spherical, and conical surfaces: this work was published at Paris in 1663. P. Deraud, Mathurin Jousse, Frezier, &c. had likewise contributed a little towards the promotion of this branch of geometry. But Monge has given it very great extension, not only by proposing and resolving various problems both curious and difficult, but by the invention of several new and interesting theorems. We can only mention in this place one or two of the problems and theorem . Thus among the problems. 1st, Two right lines being given in space, and which are neither parallel nor in the same plane, to find in both of them the points of their least distance, and the position of the line joining these points. 2d, Three spheres being given in space to determine the position of the plane which touches them. There are also curious problems relative to lines of double curvature, and to surfaces resulting from the application of a right line that leans continually upon two or three others given in position in space. Among the theorems, the following may be mentioned: if a plane surface given in space is projected upon three planes, the one horizontal, and the two others vertical and perpendicular to each other, the square of that surface will be equal to the sum of the squares of the three surfaces of projection. This theorem is as interesting in the geometry of solids, as Pythagoras's theorem (Euc. 1. xlvii.) is in plane geometry. But for more on this subject we must refer to Monge's and Lacroix's ingenious works entitled *Geometrie Descriptive*.

Geometry of the Compasses, a species of geometry more ingenious than profound, lately

proposed by the Abbe' Mascheroni. Hitherto both the ruler and the compasses have been made use of in the solution of problems in plane geometry, and it had not been imagined that problems could be solved or constructed without the combined use of these two instruments. But the Abbé Mascheroni has struck out a greater number of problems, which are rendered very piquant and amusing, by the new condition of employing only the compasses in their solution. Thus: two points terminating a right line being given, to find either between those two points or exteriorly any number of points which shall be in the same right line with the former, and which shall be with the interval between them in a given ratio: to draw to a given line perpendiculars, or parallels, or lines making with them given angles: to inscribe or circumscribe within or about a circle, the various polygons which are constructible by plane geometry: to determine the mean proportional between two given distances; or to find third and fourth proportionals: all the problems indeed of the Euclidean geometry are here resolved by the simple intersection of arcs of circles, without drawing a single right line. He also resolves by ingenious approximations many problems which lie beyond the limits of common geometry, as those relating to duplications, trisections, &c. still employing only the compasses. The inquisitive reader will be much entertained with the work entitled *Geometria del Compassa*, in which these curious particulars are explained with much perspicuity and elegance. A French translation of this work was published in 1798, in 1 vol. 8vo.

GEOPO'NICAL. *a.* [γη and πονος.] Relating to agriculture. (*Brown*).

GEOPO'NICS. *s.* [and πονος.] The science of cultivating the ground, the doctrine of agriculture.

GEORGE I. king of England, was the eldest son of Ernest Augustus, elector of Brunswick Lunenburg, or Hanover, by the princess Sophia, daughter of Frederic, elector Palatine, and king of Bohemia, and of Elizabeth daughter of James I. He was born in 1660, created duke of Cambridge in 1706, and succeeded queen Anne in 1714. The next year a rebellion broke out in Scotland, in favour of the pretender, which, however, was shortly quelled. In his reign parliaments were made septennial, and the order of the Bath was revived. In 1720 happened the failure of the famous South sea scheme, by which many thousands were ruined. He died June 11, 1727, at Osnaburgh.

The following character of this monarch is extracted from Allen's History of England:—"George the first was plain and simple in his person and address, grave and composed in his deportment, though easy, familiar, and facetious in his hours of relaxation. He is said to have been the only prince of his time who knew what it was to enjoy the sweets of private friendship; a pleasure from which sovereigns in general are, by the elevation of their rank, excluded. He had given a proof of his political abilities before his arrival in this island. Naturally inclined to justice and equity, though he was absolute and despotic in his hereditary dominions, he ruled them with all the lenity and moderation of a limited monarch. He considered civil and religious liberty as the unalienable right of mankind; and therefore he granted it to a people who pleaded no other claim to it than the known goodness and humanity of his temper. Possessed of these noble and generous sentiments, though his accession to the British throne enlarged his sphere of action, it did not alter his plan of conduct; that was uniformly and invariably the same, both before and after his advancement to that high dignity. In a word, it may be affirmed, that no prince was ever better qualified to sway the sceptre over a free people, nor any who ever exercised the virtues of a great and good governor with more distinguished ability, or more uninterrupted success."

GEORGE II. king of England, succeeded his father in 1727. In 1737 he lost his queen Caroline, a woman of excellent qualities, and of a strong mind. In 1739 admiral Vernon was sent with a squadron to the West Indies, where he demolished Porto Bello, but failed in his attempt on Carthagena. In 1743 George put himself at the head of his army on the continent, and gained the battle of Dettingen, June 16th. In August 1745, the pretender's eldest son landed in the Highlands, and was joined by several clans. After obtaining several successes, the rebels were defeated by the Duke of Cumberland, at Culloden, in 1746. In 1748 peace was concluded at Aix-la-Chapelle. In March, 1750, died, universally lamented, Frederic prince of Wales, between whom and his father there had never been any cordiality. The next year an act passed for regulating the commencement of the year, by abolishing the old style. In 1753 another famous act passed for preventing clandestine marriages. In 1755 war broke out between the English and the French, which was at first very unpromising; Braddock was defeated and killed in North America, and Minorca was taken in the Mediterranean, for which admiral Byng, who was sent out to relieve it, was shot at Portsmouth. About this time Mr. Pitt became prime minister, and public affairs began at length to wear a new face under his active management. In 1768, a treaty was entered into between England and Prussia, which proved very burthensome to the former nation; but the successes with which our fleets and armies were attended, made the people cheerful under all the expences of the war. The British flag waved triumphant in every sea; and Geo. II. died suddenly amidst the blaze of glory, October 25th 1760; and was succeeded by his grandson, our present gracious sovereign.

"The memory of George II. (says Guthrie), is reprehensible on no head but his predilection for his electoral dominions. He never could form an idea that there was any difference between them and his regal dominions; and he was sometimes ill enough advised to declare so much in his speeches to parliament. We are, however, to remember, that his people gratified him in this partiality, and that he never acted by power or prerogative. He was just rather than generous; and in matters of œconomy,

either in his state or his household, he was willing to connive at abuses, if they had the sanction of law and custom. He was not very *accessible to conversation*, and therefore it was no wonder that having left Germany, after he had attained to man's estate, he still retained foreign notions both of men and things. In government he had no favourite; for he parted with sir Robert Walpole's administration with great indifference, and shewed very little concern at the subsequent revolutions among his servants. This quality may be deemed a virtue, as it contributed greatly to the internal quiet of his reign, and prevented the people from loading the king with the faults of his ministers. In his personal disposition he was passionate, but placable; fearless of danger, fond of military parade, and enjoyed the memory of the campaigns in which he served when young. His affections, either public or private, were never known to interfere with the ordinary course of justice; and though his reign was distracted by party, the courts of justice were never better filled than under him."

GEORGE (St.), or GEORGE *of Cappadocia*; a name whereby several orders, both military and religious, are denominated. It took its rise from a saint or hero famous throughout all the East, called by the Greeks Μεγαλομα,τυρ, q. d. great martyr. On some medals of the emperors John and Manuel Comneni, we have the figure of St. George armed, holding a sword or javelin in one hand, and in the other a buckler, with this inscription; an O, and therein a little Α, and ΓΕ$\frac{\text{P}}{\text{O}}$ΓΙΟC, making Ο ΑΓΙΟΣ ΓΕΟΡΓΙΟΣ, *O holy George*. He is generally represented on horseback, as being supposed to have frequently engaged in combats in that manner. He is highly venerated throughout Armenia, Muscovy, and all the countries which adhere to the Greek rite; from the Greek, his worship has long ago been received into the Latin church; and England and Portugal have both chosen him for their patron saint. Great difficulties have been raised about this saint or hero. His very existence has been called in question. Dr. Heylin, who wrote first and most about him, concluded with giving him entirely up, and supposing him only a symbolical device; and Dr. Pettingal has turned him into a mere Basilidian symbol of victory. Mr. Pegg, in a paper in vol. i. of the Archæologia, has attempted to restore him. And finally, Mr. Gibbon (Hist. vol. II p. 404.) has sunk him into an Arian bishop in the reigns of Constantius and Julian. The bishop alluded to,

GEORGE *the Cappadocian*, was so surnamed, according to our author, from his parents or education; and was born at Epiphania, in Cilicia, in a fuller's shop. "From this obscure and servile origin he raised himself by the talents of a parasite: and the patrons whom he assiduously flattered procured for their worthless dependent a lucrative commission, or contract, to supply the army with bacon. His employment was mean: he rendered it infamous. He accumulated wealth by the basest arts of fraud and corruption; but his malversations were so notorious, that George was compelled to escape from the pursuits of justice. After this disgrace, in which he appears to have saved his fortune at the expence of his honour, he embraced, with real or affected zeal, the profession of Arianism. From the love, or the ostentation, of learning, he collected a valuable library of history, rhetoric, philosophy, and theology; and the choice of the prevailing faction promoted George of Cappadocia to the throne of Athanasius." His conduct in this station is represented by our historian as polluted by cruelty and avarice, and his death considered as a just punishment for the enormities of his life, among which Mr. Gibbon seems to rank his "enmity to the Gods."

The immediate occasion of his death, however, as narrated by ecclesiastical writers, will not probably appear calculated to add any stain to his memory. "There was in the city of Alexandria a place in which the heathen priests had been used to offer human sacrifices. This place, as being of no use, Constantius gave to the church of Alexandria, and George the bishop gave orders for it to be cleared, in order to build a Christian church on the spot. In doing this they discovered an immense subterraneous cavern, in which the heathen mysteries had been performed, and in it were many human skulls. These, and other things which they found in the place, the Christians brought out and exposed to public ridicule. The heathens, provoked at this exhibition, suddenly took arms, and rushing upon the Christians, killed many of them with swords, clubs, and stones: some also they strangled, and several they crucified. On this the Christians proceeded no farther in clearing the temple; but the heathens, pursuing their advantage, seized the bishop as he was in the church, and put him in prison. The next day they dispatched him; and then fastening the body to a camel, he was dragged about the streets all day, and in the evening they burned him and the camel together. This fate, Sozomen says, the bishop owed in part to his haughtiness while he was in favour with Constantius, and some say the friends of Athanasius were concerned in this massacre; but he ascribes it chiefly to the inveteracy of the heathens, whose superstitions he had been very active in abolishing.

St. George, the patron saint of England, and of the order of the Garter, is much revered in Russia, and his figure occurs in all the churches. He is represented as usual, riding on a horse, and piercing a dragon with his lance. This same device also forms part of the arms of the Russian sovereign, and is observed upon several of the coins. As most persons endeavour, if possible, to derive every custom and allusion from their own country, some of the English historians have conjectured, that Ivan Vassilievitch the Second, being presented with the Garter by Queen Elizabeth, assumed the George and the Dragon for his arms, and

ordered it to be stamped upon the current money. But this supposition is erroneous, as it by no means appears, that the Tzar was created a knight of the Garter; and it is certain that the sovereigns of Moscow bore this device before they had the least connection with England; for the arms of Moscovy are thus described by Chanceler, the first Englishman who discovered Russia, as being affixed to a dispatch sent in 1554, from Ivan Vassilevitch to Queen Mary:—"This letter was written in the Muscovian tongue, in letter much like to the Greeke letters, very faire written in paper, with a broade seale hanging at the same, sealed in paper upon waxe. This seale was much like the broad seale of England, having on the one side the image of a man on horseback in complete harnesse fighting with a dragon." Hackluyt, vol. 1. p. 255.

Many writers are of opinion that the history of St. George is an allegory; others maintain that the device is borrowed by the Christian church from the ancient story of Perseus and the sea-monster, of Bellerophon and the Chimera, or of Apollo and the serpent Pithon, or from some Egyptian hieroglyphics, or from charms and amulets worn by the Pagans; others have traced his legend from the history of George of Cappadocia, the Arian archbishop of Alexandria. Amongst the authors who have written upon this subject with the greatest success, must not be omitted Mr. Byrom (Miscellaneous Poems, vol. i. p. 100), who has composed a metrical rhapsody addressed to lord Willoughby, president of the Antiquarian Society, in which he endeavours to prove that St. George is a corruption of St. Gregory; and to use his own words:—

Now, my lord, I would ask of the learn'd and laborious,
If Ge-orgius ben't a mistake for Gregorius?
In names so like letter'd it would be no wonder,
If hasty transcribers had made such a blunder;
And mistake in the names by a slip of their pen,
May, perhaps, have occasioned mistake in the men.
That this has been made, to omit all the rest,
Let a champion of yours, your own Selden attest;
See his book upon titles of honour—that quarter
Where he treats of St. George, and the knights of the Garter.

And again:

This, my lord, is the matter—the plain simple rhimes
Lay no fault, you perceive, upon Protestant times:
I impute the mistake, if it should be one, solely
To the pontiffs succeeding, who christen'd wars holy;
To monarchs who madding, around their round tables,
Preferr'd, to conversion, their fighting and fables:
When soldiers were many, good Christians but few,
St. George was advanc'd to St. Gregory's due.
One may be mistaken—and therefore would beg
That a Willis, a Stukely, an Ames, or a Pegge,
In short, that your lordship, and all the fam'd set,
Who are, under your auspicies, happily met
In perfect good humour—which you can inspire,
As I know by experience—would please to enquire,
To search this one question, and settle, I hope,
Was old England's old patron, a knight, or a pope?

In opposition to these opinions, several authors have entered the lists; particularly Heylin, Selden, and Fuller; and lately, Mr. Pegge endeavours to rescue this saint from annihilation, and to prove, at the same time, that he was a different personage from St. Gregory. But unfortunately for the arguments of the learned antiquarian, Mr. Byrom's treatise, which he opposes, is written in verse with so much ease, humour, and whimsical rhyming, that the reader is almost divested of his judgment, and with difficulty is prevented by the most weighty reasons from siding with the poet, who, instead of dull and dry disquisitions, treats us with much wit, couched in an easy flow of doggrel metre.

George. *s.* (*Georgius*, Latin.) 1. A figure of St. George on horseback worn by the knights of the garter (*Shak.*). 2. A brown loaf (*Dry.*).

George (Fort St.). See Madras.

George (St.), one of the Azores, inhabited by about 5000 persons, who cultivate much wheat. Lat. 38. 39 N. Lon. 28. 0 W.

George's islands (King), are two islands in the South sea, lying in W. lon. 144. 56 S. lat. 14. 28. They were first discovered by commodore Byron in 1765, and have since been visited by captain Cook in 1774. Commodore Byron's people had an encounter with the inhabitants, which proved fatal to some of the natives; but captain Cook was more fortunate. A lieutenant and two boats well armed wers sent on shore by captain Cook, and landed without opposition. As soon as the gentlemen landed, the islanders embraced them by touching noses, a mode of civility used in New Zealand, which is 900 leagues distant, and the only place besides this where the custom has been observed to prevail. Notwithstanding this ceremony, however, very little real friendship seemed to take place on the part of the islanders.

George town, the seat of justice in a dis-

trict of the same name in S. Carolina. Lat. 33. 20 N. Lon. 79. 30 W.

GEORGIA, a country of Asia, called by the Persians Gurgistan, and by the Turks Gurtshi. It is one of the seven Caucasian nations, in the countries included between the Black sea and the Caspian, and comprehends the ancient Iberia and Colchis. It is bounded on the N. by Circassia, on the E. by Daghestan and Schirvan, on the S. by Armenia, and on the W. of the Cuban, or new Russian government of Caucasus. It is divided into nine provinces. Of these, five are subject to Heraclius, and form what is commonly called the kingdom of Georgia; and four, which are subject to David, form the kingdom or principality of Imeretia. This country is so extremely beautiful, that some fanciful travellers have imagined they had here found the situation of the original garden of Eden. The hills are covered with forests of oak, ash, beech, chesnuts, walnuts, and elms, enriched with vines, growing perfectly wild, but producing vast quantities of grapes. From these is annually made as much wine as is necessary for their yearly consumption; the remainder are left to rot on the vines. Cotton grows spontaneously, as well as the finest European fruit-trees. Rice, wheat, millet, hemp, and flax, are raised on the plains almost without culture. The valleys afford the finest pasturage in the world; the rivers are full of fish; the mountains abound in minerals; and the climate is delicious; so that nature appears to have lavished on this favoured country every production that can contribute to the happiness of its inhabitants. On the other hand, the rivers of Georgia, being fed by mountain torrents, are always either too rapid or too shallow for the purposes of navigation; the Black sea, by which commerce and civilization might be introduced from Europe, has been till very lately in the exclusive possession of the Turks; the trade of Georgia by land is greatly obstructed by the high mountains of Caucasus; and this obstacle is still increased by the swarms of predatory nations, by which those mountains are inhabited. The inhabitants are Christians of the Greek communion, and appear to have received their present name from their attachments to St. George, the tutelary saint of these countries. Their dress nearly resembles that of the Cossacs; but men of rank frequently wear the habit of Persia. They usually dye their hair, beards, and nails with red. The women employ the same colour to stain the palms of their hands.

Georgia, the most southern of the United States of N. America, bounded on the E. by the Atlantic ocean, on the S. by E. and W. Florida, on the W. by the river Mississippi, and on the N. by N. and S. Carolina, being divided from the latter by the river Savannah. It is about 600 miles long and 250 broad. It is divided into 11 counties, namely, Chatham, Effingham, Burke, Richmond, Wilkes, Liberty, Glynn, Camden, Washington, Greene, and Franklin. The capital is Augusta. The principal rivers are the *Savannah, Ogeechee, Alatamaha, Turtle River, Little Sitilla, Great* Sitilla, Crooked River, St. Mary's, and Appalachikola. The winters in Georgia are very mild and pleasant. Snow is seldom or never seen. The soil and its fertility are various, according to situation and different improvements. By culture are produced rice, indigo, cotton, silk, India corn, potatoes, oranges, figs, pomegranates, &c. Rice at present is the staple commodity; but great attention begins to be paid to the raising of tobacco. The whole coast of Georgia is bordered with islands, the principal of which are Skidaway, Wassaw, Ossahaw, St. Catharine's, Sapelo, Frederica, Jekyl, Cumberland, and Amelia. For more on the subject of this state, see Cruttwell's Gazetteer.

Georgia (New), or South Georgia, an island in the South Atlantic ocean, about thirty leagues in length, and ten in breadth. It abounds in bays and harbours, but the prodigious quantity of ice on the coast renders it inaccessible during a great part of the year, and even at other times floating masses of ice render the anchorage dangerous. The appearance of the land is the same throughout; the lofty mountains towards the south are divided into numberless parts, and appear like flames of fire. The coasts are bounded with high perpendicular rocks of ice, large portions of which frequently break off and fall into the valleys or into the sea, where they are tossed about by the waves, and resemble small detached islands. The interior country is not less savage, the summits of the rocks are lost in the clouds, and the valleys are covered with eternal snow; there is neither tree nor shrub. The only vegetables discovered were a kind of coarse grass, a species of burnet, and a plant like moss. The rocks are composed of a kind of slate, of a blueish grey colour, disposed in horizontal beds: many shining fragments of which cover the strand, and appear to have no mineral in the composition. In all the coast there was found neither river nor fresh-water spring. Lat. 54. 30 S. Lon 37. 0 W.

GEORGIC, a poetical composition upon the subject of husbandry, containing rules therein, put into a pleasing dress, and set off with all the beauties and embellishments of poetry. The word is borrowed from the Latin *georgicus*, and that of the Greek γεωργικος, of γη, *terra*, earth, and εργαζομαι, *opero*, I work, or labour, of εργον, *opus*, work. Hesiod and Virgil are the two greatest masters in this kind of poetry. The moderns have produced nothing in this way, except Rapin's book of Gardening; and the celebrated poem intitled Cyder, by Mr. Philips, who, if he had enjoyed the advantage of Virgil's language, would have been second to Virgil in a much nearer degree.

GEORGINA, in botany, a genus of the class syngenesia, order polygamia superflua. Receptacle chaffy, downless; calyx double, the outer many-leaved; inner one-leaved; eight-parted. Three species; all natives of Mexico.

GEORGIUM SIDUS, the name given by

Dr. Herschel to the planet which he discovered. It is sometimes called Uranus; but the majority of astronomers have, as it were, by common consent, given it the name of its discoverer. See HERSCHEL and ASTRONOMY.

GEO'TIC. *a.* Belonging to the earth.

GERANIUM. Cranesbill. In botany, a genus of the class monadelphia, order decandria. Calyx five-leaved; petals five, regular; nectary five glands fixed to the base of the longer filaments; fruit beaked, separating into five one-seeded capsules, each tipped with a long simple awn, which is neither spiral nor bearded. Thirty-nine species; scattered over the globe; of which nearly half are indigenous to the pastures or thickets of our own country; and of these the doves foot (G. columbinum) is the most common.

The whole may be subdivided into,

A. Peduncles one-flowered.
B. ——— two-flowered perennial.
C. ——— two-flowered annual.

The cultivated geranium adds much to the beauty of our gardens and green-houses; and there are few, except those of the most southern climates, that may not be inured to the common temperature of our external atmosphere, if proper pains be taken to accustom them to the change gradually. They may all be propagated either by seeds or cuttings; the cuttings may be made in any of the summer months, and when well rooted should be exposed till October to the external air to harden them.

GERAR, or GERARA, the south boundary of Canaan near Berseba, situated between Cades and Sur, two deserts well known, the former facing Egypt, the latter Arabia Patræa.

GERARDIA. In botany, a genus of the class didynamia, order angiospermia. Calyx five-cleft, corol two-lipped; the lower lip three-parted with the lobes emarginate; the middle lip two parted; capsule three-celled, gaping. Twelve species; chiefly American and Cape plants.

GERARDS (Mark), a painter of Bruges, born in 1571. About 1580 he came to England, and was appointed principal painter to queen Elizabeth. He was eminent in history, portrait, and landscapes; and died in 1635.

GERAW, a town of Germany, in Hesse Darmstadt, capital of a district of the same name. Lat. 49. 45 N. Lon. 8. 29 E.

GERBES, GERBI, or ZERBI, an island of Africa, on the coast of the kingdom of Tunis. It bears no corn but barley; though there are large quantities of figs, olives, and grapes, which, when dried, form their principal trade. It depends on the dey of Tripoli. Lon. 10. 30 E. Lat. 33. 50 N.

GE'RENT. *a.* (*gerens*, Latin.) Carrying; bearing.

GE'RFAI CON. *s.* A bird of prey, in size between a vulture and a hawk. See FALCO.

GERGESA, a trans-Jordan town, no otherwise known than by the *Gergeseni* of St. Matthew, and *Gergesæi* of Moses; supposed to have stood in the neighbourhood of Gadar and near the sea of Tiberias.

GERM. See GERMEN.

GERMAIN (St.), a town of France, in the department of Seine and Oise, and late province of the Isle of France. It is seated on the river Seine, and has a magnificent palace embellished by several kings. Lat. 48. 52 N. Lon. 2. 15 E.

GERMAIN'S (St.), a borough in Cornwall, with a market on Fridays. It was once the largest town in the county, and a bishop's see. It now consists chiefly of fishermen's cottages; but is governed by a mayor. Lat. 50. 22 N. Lon. 4. 24 W.

GERMAN, in a genealogical sense, signifies whole, entire, or own. Hence, *brother-german*, denotes a brother both by the father's and mother's side, in contradistinction to uterine brothers, &c. who are only so by the mother's side. *Cousins-german*, are those in the first or nearest degree, being the children of brothers or sisters.

GERMAN, or GERMANIC, also denotes any thing belonging to Germany.

GERMANDER TREE. See TEUCRIUM.

GERMANICUS, a name common in the age of the emperors, not only to those who had obtained victories over the Germans, but even to those who had entered Germany at the head of an army. The most celebrated among them was Germanicus Cæsar, a son of Drusus, and Antonia, the niece of Augustus. He was adopted by his uncle Tiberius, and raised to the most important offices of the state. When Augustus died, he was employed in a war in Germany, and the affection of the soldiers unanimously saluted him emperor. He refused this honour, continued his wars, and defeated the celebrated Arminius, and was rewarded with a triumph at his return to Rome. Tiberius declared him emperor of the east, and sent him to appease the seditions of the Armenians. But the success of Germanicus in the east was soon looked upon with an envious eye by Tiberius. He was secretly poisoned at Daphne by Piso, A.D. 19, in the 34th year of his age. The news of his death was received with the greatest grief. He had married Agrippina, by whom he had nine children, one of whom, Caligula, disgraced the name of his illustrious father. Germanicus has been commended, not only for his military accomplishments, but also for his learning, humanity, and extensive benevolence.

GERMANY, a country of Europe, in ancient times inhabited by various nations who derived their origin from the Celts and Sclavonians, or Vandals, differing in language and in manners. Germany, the name given to the whole country, is most generally supposed to be Roman, though the word by some is thought to be derived from a Teutonic word, which signifies warlike. It is bounded on the E by Hungary and Poland, on the N. by the Baltic Sea and Denmark, on the W. by France and the Netherlands, and on the S. by

the Alps, Swisserland, and Italy: being about 640 miles in length, and 550 in breadth. The air is temperate and wholesome; but as to the particular productions, they will be taken notice of where the circles are described. Germany contains a great many princes, secular and ecclesiastic, who are independent of each other; and there are a great number of free imperial cities, which are so many little republics, governed by their own laws, and united by a head who has the title of emperor. The western Roman empire which had terminated in the year 475, in the person of Augustulus, the last Roman emperor, and which was succeeded by the reign of the Huns, the Ostrogothss, and the Lombards, was revived by Charlemagne, king of France, on Christmas-day in the year 800. This prince being then at Rome, pope Leo III. crowned him emperor, in St. Peter's church, amid the acclamations of the clergy and the people. Nicephorus, who was at that time emperor of the East, consented to this coronation. After the death of Charlemagne, and of Lewis le Debonnaire, his son and successor, the empire was divided between the four sons of the latter. Lothario, the first, was emperor; Pepin was king of Aquitaine; Lewis king of Germany; and Charles le Chauve (the Bald) king of France. This partition was the source of incessant feuds. The French kept the empire, under eight emperors, till the year 912, when Lewis III. the last prince of the line of Charlemagne, died without issue male. Conrad, count of Franconia, the son-in-law of Lewis, was then elected emperor. Thus the empire went to the Germans, and became elective; for it had been hereditary under the French emperors, its founders. The emperor was chosen by the princes, the lords, and the deputies of cities, till toward the end of the 13th century, when the number of the electors was fixed. Rodolphus, count of Hapsburgh, was elected emperor in 1273. He is the head of the house of Austria, which is descended from the same stock as the house of Lorrain, reunited to it in the person of Francis I. father of the two late emperors, Joseph and Leopold. On the death of Charles VI. of Austria in 1740, an emperor was chosen from the house of Bavaria, by the name of Charles VII. On the death of this prince in 1745, the abovementioned Francis, grand duke of Tuscany, was elected emperor; whose grandson, Francis, now enjoys the imperial dignity; the prerogatives of which were formerly much more extensive than they are at present. At the close of the Saxon race in 1024, they exercised the right of conferring all the ecclesiastical benefices in Germany; of receiving their revenues during a vacancy; of succeeding to the effects of intestate ecclesiastics; of confirming or annulling the election of the popes; of assembling councils, and of appointing them to decide concerning the affairs of the church; of conferring the title of king on their vassals; of granting vacant fiefs; of receiving the revenues of the empire; of governing Italy as its proper sovereigns; of erecting free cities, and establishing fairs; of assembling the diets of the empire, and fixing the time of their duration; of coining money, and conferring the same privilege on the states of the empire; and of administering justice within the territories of the different states; but in 1437 they were reduced to the right of conferring all dignities and titles, except the privilege of being a state of the empire; of appointing once during their reign a dignitary in each chapter or religious house; of granting dispensations with respect to the age of majority; of erecting cities, and conferring the privilege of coining money; of calling the meetings of the diet, and presiding in them. To this some have added a few particulars, which we have enumerated under the article EMPEROUR. The electors of the empire are three ecclesiastical, namely, the archbishops of Treves, Cologne, and Mentz; and five secular, namely, the king of Prussia, as elector of Brandenburgh: the king of Great Britain, as elector of Hanover; the present emperor, as archduke of Austria; the elector of Saxony, and the elector palatine of the Rhine. Each elector bears the title of one of the principal officers of the empire; the elector of Hanover, for instance, being "arch-treasurer and elector of the holy Roman empire." To prevent the calamities of a contested election, a king of the Romans has been often chosen in the lifetime of the emperor, on whose death he succeeds to the imperial dignity, as a circumstance of course. The emperor always assumes the title of august, of Cæsar, and of sacred majesty. Although he is chief of the empire, the supreme authority resides in the diets, which are composed of three colleges; the first that of the electors, the second that of the princes, and the third that of the imperial towns. The electors and princes send their deputies, as well as the imperial towns. When the college of the electors and that of the princes disagree, that of the towns cannot decide the difference; but they are obliged to give their consent when they are of the same opinion. The diets have the power of making peace or war, of settling general impositions, and of regulating all the important affairs of the empire; but their decisions have not the force of law till the emperor gives his consent. All the sovereigns of Germany have an absolute authority in their own dominions, and can lay taxes, levy troops, and make alliances, provided they do not prejudice the empire. They determine all civil causes definitively, unless in some particular cases in which an appeal may be made. These appeals are to two courts, called the Imperial Chamber, and the Aulic Council. The three principal religions are, the Roman Catholic, the Lutheran, and the Calvinistic. The first prevails in the dominions of the emperor, in the ecclesiastical electorates, and in Bavaria; the second, in the circles of Upper and Lower Saxony, great part of Westphalia, Franconia, Suabia, the Upper Rhine, and in most of the

Imperial towns; the third, in the dominions of the landgrave of Hesse Cassel, and of some other princes. But Christians of almost every denomination are tolerated in many parts of the empire, and there is a multitude of Jews in all the great towns. The principal rivers of Germany are, the Danube, Rhine, Elbe, Weser, Maine, and Oder. Germany is divided into nine circles, each of which comprehends several other states; the princes, prelates, and counts of which, with the deputies of the imperial towns, meet together about their common affairs. Each circle has one or two directors, and a colonel: the directors have a power of convoking the assembly of the states of their circle, and the colonel commands the army. The nine circles are those of Austria, Bavaria, Suabia, Franconia, Upper and Lower Rhine, Westphalia, and Upper and Lower Saxony. The language of Germany is a dialect of the Teutonic, which succeeded that called the Celtic.

Such *was* the state of Germany, and its subordinate governments, in 1802, when much of the geographical department of the Pantologia was prepared for the press. Since that period Germany has been almost constantly the seat of war; and it is now (1809) almost entirely under the power of France. Its capital, Vienna, has been possessed by a French army; its emperor has changed his title from emperor of Germany to emperor of Austria; and it seems extremely probable that he will become a mere dependent upon the liberality and justice of Buonaparte!

GERMEN. In botany. Germ, ovary, or seed-bud. Rudimentum fructus immaturi in flore. The rudiment of the fruit yet in embryo. Analogous to the ovary of animals, since it contains the rudiments of the seeds. It is the lower part or base of the PISTIL, which see. Germ, differing little from the Latin term, and being sufficiently established as an English word, may be used in preference to Germen, and afforms a much better plural.

A germ, when included within the corol, is said to be superior; but when placed below it, inferior. On the contrary, when a corol is placed above the germ, the corol is called superior (*corolla supera, flos superus*); and when it incloses the germ, so as to have its base below it, it is called inferior (*corolla infera, flos inferus*). When a germ is elevated on a fulcre, besides the peduncle, it is said to be pedicelled.

To GE'RMINATE. *v. n.* (*germino*, Latin.) To sprout; to shoot; to bud (*Woodward*).

GERMINA'TION. *s.* (*germination*, Fr.) The act of sprouting; growth (*Wotton*).

GERMINATION OF PLANTS. When a seed is placed in a situation favourable to vegetation, it very soon changes its appearance. The radicle is converted into a root, and sinks into the earth; the plumule, on the other hand, rises above the earth, and becomes the trunk or stem. During these changes the seed is said to germinate; and the process itself is called germination.

Seeds do not germinate equally and indifferently in all places and seasons: germination, therefore, does not depend upon the seed alone, something external must also affect it.

These auxiliaries have been examined into, and appear to be moisture, heat, and oxygen; for without the presence and co-operation of these, seeds cannot be made to germinate: they never germinate in perfect dryness, below the freezing point, nor in the vacuum of an air-pump.

Light has been supposed to be an auxiliary by some physiologists; but it has since been pretty accurately ascertained that light only assists germination when combined with heat, and that when pure and separate from heat, it rather retards than promotes germination; and hence one reason for covering seeds over with the soil in which they grow.

Electricity has also been tried, but with a doubtful result. Generally speaking, it seems to advance the process of germination; but this is not an universal effect,nor is it perfectly clear, in the cases in whichit is said to have succeeded, that some other agency did not co-operate.

In what manner do these substances of moisture, heat, and oxygen, affect the seed? What are the changes which they produce?

In the article BOTANY we have observed that every seed possesses one or more cotyledons, which contain a quantity of farinaceous matter laid up on purpose to supply the embryo plant with food as soon as it begins to require it, as well as to communicate to the heartlet the auxiliaries which germination demands. This food, however, must undergo some previous preparation, before it can be applied by the plant to the formation or completion of its organs. It is probable that all the phænomena of germination, which we can perceive, consist in the chemical changes which are produced in that food, and the consequent developement of the organs of the plant.

These chemical changes consist in the evolution of carbonic acid, which is always emitted, even though no oxygen gass be present; in the absorption of oxygen, and in the production of heat, which last is thrown forth so abundantly that hay often takes fire in consequence hereof; at the same time that a quantity of sugar is formed, a result taken advantage of by our maltsters and distillers, and the very basis of the arts of distillation and brewery. It is owing to a partial change of this kind that old hay generally tastes much sweeter than new hay. Now we have no reason to suppose that any agents peculiar to the vegetable kingdom reside in hay; as all vegetation and all power of vegetating are evidently destroyed.

When the farina of the vegetable vessels is thus converted into sugar, a number of vessels make their appearance in the cotyledon. Branches from these vessels pass into the radicle, which in consequence increases in size and becomes a root, sinks into the earth, and extracts nourishment for the future growth of

the plant. The cotyledon next assumes the semblance of leaves, which appear above ground, forming what are called the seminal leaves of the plant. After this the plumule, assisted from the same quarter, gradually increases in size, rises out of the earth, and expands itself into branches and leaves. The seminal leaves, soon after this, decay and drop off, and the plant carries on the process of vegetation without their assistance. For other phænomena of vegetation, see the articles BOTANY, CONVERTIBILITY, PHYSIOLOGY, and VEGETABLE.

GERONTES, in antiquity, a kind of judges or magistrates in Sparta, similar to the Areopagites at Athens. None were admitted to this office under 60 years of age. They were succeeded by the ephori.

GEROPOGON. Old-man's beard. In botany, a genus of the class syngenesia, order polygamia æqualis. Receptacle with bristle-like chaff or naked calyx, many-leaved, simple or inverted with scales; seeds of the disk with a feathery down of the ray five-awned. Three species; natives of Italy; not greatly differing from many species of TRAGOPOGON, which see.

GERS, a department of France, which includes the late provinces of Gascony and Armagnac. It has its name from a river that waters Auch and Lectoure, and falls into the Garonne, above Agen. Auch is the capital.

GERSAU, a town of Switzerland, on the N. side of the lake of Schweitz, at the foot of the Rigi. It is a republic, the smallest in Europe. Its territory is two leagues in length and one in breadth. It contains 1000 inhabitants, who have their general assembly of burgesses, their landamman, council of regency, courts of justice, and militia. Gersau is composed entirely of scattered houses and cottages, of a very neat and picturesque appearance. The inhabitants are much employed in preparing silk for the manufacture at Basle. This republic is under the protection of the cantons of Lucern, Vri, Schweitz, and Underwalden; and, in case of war, furnishes its quota of men. Gersau is 12 miles S.W. of Schweitz.

GERTERDENBERG, an ancient town of Dutch Brabant, in the Netherlands, 10 miles N. of Breda. Lat. 52. 44 N. Lon. 4. 52 E.

GERUMENHA, a strong town of Alentejo, in Portugal. Lat. 38. 26 N. Lon. 7. 10 W.

GERUND, in grammar, a verbal noun of the neuter gender, partaking of the nature of a participle, declinable only in the singular number, through all the cases except the vocative; as nom. *amandum*, gen. *amandi*, dat. *amando*, accus. *amandum*, abl. *amando*. The word is formed of the Latin *gerundivus*, and that from the verb *gerere*, to bear. The *gerund* expresses not only the time, but also the manner of an action; as, "he fell in running past." It differs from the participle in expressing the time, which the participle does not.

GESNER (Conrad), an eminent physician and philosopher, was born at Zurich, in Switzerland, in 1516. His father was too poor to give him a learned education; and, though he soon displayed a lively genius, he was on the point of being taken from his studies, when Ammian, professor of Latin and eloquence at Zurich, took him to his own house to complete his education. After his father's death he travelled to mend his fortune. At Strasburg he made some progress in the Hebrew language. Being allowed a pension by the academy of Zurich to enable him to make the tour of France, he went to Paris, accompanied by John Frisius. He afterwards returned to Zurich to preside over a school, but having married, and his appointment being inadequate to his expences, he devoted all his spare time to the study of physic, to which even in his childhood he had a strong propensity. He went to Basil, where he studied the Greek physicians in their own language, till he was made Greek professor at Lausanne. He went to Montpelier, and applied himself to anatomy and botany; and returning to Zurich was admitted to a doctor's degree, and practised as a physician. He was soon afterwards made professor of philosophy, which situation he filled till his death in 1565. He wrote sixty-six works on grammar, botany, medicine, and natural history; and for the variety of his attainments was called the German Pliny.

GESNER (Soloman), a bookseller and poet, was born at Zurich in 1730. He was a member of the senate of that city, and excelled in landscape painting as well as in poetry. Most of his pictures were sold in England, where his beautiful piece, intitled, the Death of Abel, is also well known. He died in 1788. He wrote several elegant poems besides that above mentioned; particularly, Daphnis, Erastus and Evander, his Idylls, and the First Navigator. Gesner often displays the humour of Sterne and Fontaine, without their licentiousness; his fictions are interesting; his language graceful and easy; and his characters extremely well delineated.

GESNER (John Matthew), a profound scholar and most acute critic, was born neai Newburg, in Germany, in 1691. On the recommendation of Buddeus, he was appointe to superintend the public school of Weinheim which situation he filled eleven years. Fron Weinheim he was removed to Anspach, to more lucrative office; and he finally settled a Gottingen, where he was made professor c humanity, public librarian, and inspector c public schools in the district of Lunenburgl He died at Gottingen in 1761. His most e teemed works are, editions of some of th classics, and an excellent Thesaurus of tl Latin Tongue.

GESNERIA, in botany, a genus of the cla didynamia, order angiospermia. Calyx fiv cleft, seated on the germ; corol incurved a recurved; capsule inferior, two-celled. Elev species; all natives of South America or t West Indies; some herbaceous, some shrubl

GESSES. *s.* The furniture belonging tc hawk.

GEST. *s.* (*gestum*, Latin.) Obsolete. 1. A deed; an action; an achievement (*Spenser*). 2. Show; representation. 3. The roll or journal of the several days, and stages prefixed, in the progresses of kings (*Shakspeare*). 4. A stage; so much of a journey as passes without interruption (*Brown*).

GESTATION. *s.* (*gestatio*, Latin.) The act of bearing the young in the womb (*Ray*).

To GESTICULATE. *v. n.* (*gesticulor*, Lat.) To play antic tricks; to show postures.

GESTICULATION. *s.* (*gesticulatio*, Latin.) Antic tricks; various postures.

GESTRIKE, a province of Sweden, bounded on the N. by Helsingia, on the E. by the gulf of Bothnia, on the S. by Upland, and on the W. by Dalecarlia. It is diversified by forests, rocks, hills, and dales, pasture and arable land, lakes and rivers.

GESTURE. *s.* (*gestum*, Latin.) 1. Action or posture expressive of sentiment (*Sidney*). 2. Movement of the body (*Addison*).

To GE'STURE. *v. a.* (from the noun.) To accompany with action or posture (*Hooker*).

To GET. *v. a.* pret. *I got*, anciently *gat*; part. pass. *got* or *gotten*. (ʒetan, ʒettan, Sax.) 1. To procure; to obtain (*Boyle*). 2. To force; to seize (*Daniel*). 3. To win by contest (*Knolles*). 4. To have possession of; to have (*Herbert*). 5. To beget upon a female (*Waller*). 6. To gain as profit (*Locke*). 7. To gain a superiority or advantage (*Shakspeare*). 8. To earn; to gain by labour (*Locke*). 9. To receive as a price or reward (*Locke*). 10. To learn (*Watts*). 11. To procure to be (*South*). 12. To put into any state (*Guardian*). 13. To prevail on; to induce (*Spectator*). 14. To draw; to hook (*Addison*). 15. To betake; to remove (*Knolles*). 16. To remove by force or art (*Boyle*). 17. To put (*Shakspeare*). 18. *To* GET *off*. To sell or dispose of by some expedient (*Swift*).

To GET. *v. n.* 1. To arrive at any state or posture by degrees with some kind of labour, effort, or difficulty (*Sidney*). 2. To fall; to come by accident (*Tatler*). 3. To find the way (*Boyle*). 4. To move; to remove (*Knolles*). 5. To have recourse to (*Knolles*). 6. To go; to repair (*Knolles*). 7. To put one's elf in any state (*Clarendon*). 8. To become y any act what one was not before (*Dryden*). . To be a gainer; to receive advantage. 10. *To* GET *off*. To escape (*Dryden*). 11. *To* GET *over*. To conquer; to suppress; to pass ithout being stopped (*Swift*). 12. *To* GET To rise from repose (*Bacon*). 13. *To* ET *up*. To rise from a seat. 14. To remove om a place (*Numbers*).

GETHIN (Lady Grace), an English lady uncommon parts, was the daughter of sir orge Norton, of Abbots-Leigh, in Somershire, and born in the year 1676. She had the advantages of a liberal education, and ame the wife of sir Richard Gethin, of hin Grott, in Ireland. She was mistress of at accomplishments, natural and acquired, did not live long enough to display them to world; for she died in the 21st year of her age. She was buried in Westminster-abbey, where a beautiful monument with an inscription is erected over her; and, for perpetuating her memory, provision was made for a sermon to be preached in Westminster-abbey, yearly, on Ash-Wednesday for ever. She wrote, and left behind her in loose papers, a work which soon after her death was methodised and published under the title of Reliquiæ Gethinianæ; or, Some remains of the most ingenious and excellent lady, Grace lady Gethin, lately deceased. Being a collection of choice discourses, pleasant apophthegms, and witty sentences. Written by her, for the most part, by way of essay, and at spare hours. Lond. 1700, 4to.

GETHSEMANE, anciently a village in the mount of Olives, whither Jesus Christ sometimes retreated in the night-time. It was in a garden belonging to this village that he was arrested by Judas and the rest who were conducted by this traitor. The place is by Maundrel described as an even plot of ground, not above 57 yards square, lying between the foot of Mount Olivet and the brook Cedron.

GETHYLLIS, in botany, a genus of the class hexandria, order monogynia. Corol sixparted with a very long filiform tube. calyxless; berry clavate, radical, one-celled. Five species; all herbs of the Cape, with a single flower on a naked stalk, and a fruit of a grateful odour and pleasant taste.

GETTER. *s.* (from *get*.) 1. One who procures or obtains. 2. One who begets on a female (*Shakspeare*).

GETTING. *s.* (from *get*.) 1. Act of getting; acquisition (*Proverbs*). 2. Gain; profit (*Bacon*).

GEUM. Avens. In botany, a genus of the class icosandria, order polygynia. Calyx ten-cleft, inferior; petals five; seeds with a jointed awn, receptacle columnar. Ten species; some natives of Europe, others of America: the two following of our own country.

1. G. urbanum: with flowers erect, awns hooked, naked; stem-leaves ternate, with rounded cut stipules; radical ones lyre-pinnate. It bears a large yellow terminal flower, which is succeeded by a globular fruit. It constitutes the caryophyllata of the dispensaries; the root of which has been employed as a gentle styptic, corroborant, and stomachic. It has a mildly austere, somewhat aromatic taste, and a very pleasant smell of the clove kind. It is still used on the continent as a febrifuge.

2. G. rivale. Flowers drooping; petals as long as the calyx; awns feathery, bent in the middle. The root in North America is used in the case of intermittents, in preference to Peruvian bark. It is also employed in diarrhœas and hæmorrhages, and is said to be highly serviceable. Cattle in general eat the first of these two species; and a few, especially goats, eat the second. Horses are not fond of either.

GEVAUDEN, a late territory of Languedoc, in France, forming the present department of Lozere.

GE'WGAW. *s.* (ᵹeᵹaᵹ, Saxon.) A showy trifle; a toy; a bauble (*Abbot*).

Ge'wgaw. *a.* Splendidly trifling; showy without value (*Law*).

GEZULA, a province of Morocco, which is very productive, and contains mines of iron and copper.

G GAMMUT, in music, the first G below the bass-cliff note.

GHA'STFUL. *a.* (ᵹarꞇ and fulle, Saxon.) Dreary; dismal; melancholy (*Spenser*).

GHA'STLINESS. *s.* (from *ghastly*.) Horror of countenance; resemblance of a ghost; paleness.

GHA'STLY. *a.* (ᵹarꞇ, or *ghost*, and *like*.) 1. Like a ghost; having horror in the countenance; pale; dismal (*Knolles*). 2. Horrible; shocking; dreadful (*Milton*).

GHA'STNESS. *s.* (from ᵹarꞇ, Saxon.) Ghastliness; horrour of look: not used (*Shakspeare*).

GHE'RKIN. *s.* (from *gurcke*, German, a cucumber.) A small pickled cucumber.

GHENT, the capital of Austrian Flanders, with a strong castle and a bishop's see. It contains 70,000 inhabitants; but it is not populous in proportion to its extent, which is so great, that Charles V. said to the French king, Francis I. "I have a *glove* (the French name for Ghent is *Gand*, a glove) in which I can put your whole city of Paris." Here is still shown the house in which that emperor was born. There are several silk and woollen manufactures here, which are in a flourishing condition, and they have a great trade in corn. The city is cut by several canals, which divide it into 26 isles, and over the canals are 300 bridges. The cathedral is a noble ancient structure, dedicated to St. Buvon. Beside this, there are only six parochial churches. The Benedictine abbey of St. Peter is a magnificent edifice. Lat. 51. 3 N. Lon. 3. 49 E.

To GHESS. *v. n.* To conjecture; to guess.

GHILAN, a province of Persia, lying on the S. W. side of the Caspian sea. It is supposed to be the Hyrcania of the ancients. It is very agreeably situated, having the sea on one side, and high mountains on the other; and there is no entering it but through narrow passes, which may be easily defended. This is one of the most fruitful provinces in Persia. Resht is the capital.

GHINIA, in botany, a genus of the class diandria, order monogynia. Calyx with five awn-like teeth; corol ringent, the border five-cleft; nut fleshy, four-celled; seeds solitary. Two species; natives of Guiana and the West Indies, with axillary racemes and blue flowers: annual plants.

GHIRLANDAIO (Domenico), a Florentine painter, was born in 1449. He was intended by his friends for a goldsmith; but having a strong passion for painting, he cultivated that art with such success, that he acquired reputation in his time. His manner was however gothic and dry, and he deserves most to be celebrated for having Michael Angelo for his disciple. He died at the age of 44, leaving three sons, David, Benedict, and Rhandolph, all of them painters.

GHISOLFI (Giovanni), a painter, born at Milan in 1623, and died in 1683. He excelled in painting perspective views and sea ports, and his works are still held in high repute.

GHOST, an apparition, or spirit of a person deceased. The ancients supposed every man to be possessed of three different ghosts, which after the dissolution of the human body were differently disposed of. These three ghosts are distinguished by the names of Manes, Spiritus, Umbra. The *manes*, they fancied, went down into the infernal regions; the *spiritus* ascended to the skies; and the *umbra* hovered about the tomb, as being unwilling to quit its old connections. Thus Dido (Virg. Æn. iv. 384.) threatens Æneas after death that she will haunt him with her umbra, whilst her manes rejoice in his torments below. This idea of a threefold soul is very clearly expressed in these lines, which have been attributed to Ovid.

> Bis duo sunt nomini: *Manes, Caro, Spiritus, Umbra:*
> Quatuor ista loci bis duo suscipiunt.
> Terra tegit *Carnem*, tumulum circumvolat *Umbra*,
> Orcus habet *Manes, Spiritus* astra petit.

The most striking outlines of the popular superstitions respecting ghosts among us are humorously collected by captain Grose in his Provincial Glossary; to which we refer. With respect to the possibility or probability of ghosts being permitted to appear, we are aware that much has been said, both for and against, by persons of considerable abilities, who do not seem to be under the dominion of either superstition or prejudice: but as the question is as yet undecided, we shall not fill up our columns with any arguments relating to it.

Ghost (To give up the). To die; to yield up the spirit into the hands of God (*Shakspeare*).

To Ghost. *v. n.* (from the noun.) To yield up the ghost; to die: not in use (*Sidney*).

To Ghost. *v. a.* To haunt with apparitions of departed men: obsolete (*Shakspeare*).

GHO'STLINESS. *s.* (from *ghostly*.) Spiritual tendency; quality of having reference chiefly to the soul.

GHO'STLY. *a.* (from *ghost*.) 1. Spiritual; relating to the soul; not carnal; not secular (*Hooker*). 2. Having a character from religion; spiritual (*Shakspeare*).

GIAGH, in chronology, a cicle of 12 years, in use among the Turks and Cathayans. Each year of the giagh bears the name of some animal; the first that of a mouse; the second that of a bullock, &c.

GIA'LALINA. *s.* (Ital.) Earth of a bright gold colour (*Woodward*).

GIA'MBEUX. *s.* (*jambes*, French.) Legs, or armour for legs; greaves (*Spenser*).

GIANT, a person of extraordinary bulk and stature. The romances of all ages have furnished us with so many extravagant accounts of giants of incredible bulk and strength, that

the existence of such people is now generally disbelieved. It is commonly thought, that the stature of a man has been the same in all ages; and some have even pretended to demonstrate the impossibility of the existence of giants mathematically. Of these Mr. M'Laurin has been the most explicit, yet his arguments are by no means conclusive. In the scriptures we are told of giants, who were produced from the marriages of the sons of God with the daughters of men. This passage indeed has been differently interpreted, so as to render it doubtful whether the word translated giants does there imply any extraordinary stature. In other parts of scripture, however, giants with their dimensions are mentioned in a manner that we cannot possibly doubt; as in the case of Og king of Basan, and Goliath.

M. Le Cat, in a Memoir read before the Academy of Sciences at Rouen, gives succinct acounts of giants that are said to have existed in different ages; and of these the heights are between the limits of eight feet and 36 in height.

With regard to the credibility of all or any of M. Le Cat's accounts, it is difficult to determine any thing. If, in any castle of Bohemia, the bones of a man's leg 26 feet in length are preserved, we have indeed a decisive proof of the existence of a giant, in comparison of whom most others would be but pigmies. Nor indeed could these bones be supposed to belong to an elephant; for an elephant itself would be but a dwarf in comparison of such an enormous monster. But if these bones were really kept in any part of Bohemia, it seems strange that they have not been frequently visited, and particular descriptions of them given by the learned who have travelled into that country. It is certain, however, that there have been nations of men considerably exceeding the common stature.

But whether these accounts are credited or not, it is manifest that the stature of the human body is by no means absolutely fixed. We are ourselves a kind of giants in comparison of the Laplander; nor are these the most diminutive people to be found upon the earth. The abbe La Chappe, in his journey into Siberia in order to observe the last transit of Venus, passed through a village inhabited by people called Wotiacks, neither men nor women of whom were above four feet high. The accounts of the Patagonians also, which cannot be entirely discredited, render it very probable, that somewhere in South America there is a race of people very considerably exceeding the common size of mankind, and consequently that we cannot altogether discredit the relations of giants handed down to us by ancient authors; though what degree of credit we ought to give them is not easy to be determined. See PATAGONIA.

GIANTS (Rebel), in ancient mythology, were the sons of Terra, or the Earth, who made war against Jupiter and the celestial deities, to avenge the defeat of the Titans. These giants are represented as of an enormous height and size, and of proportionable strength: each of them had a hundred eyes, and serpents instead of legs. These rebels were vanquished by Jupiter, and cast into Tartarus.

GIANTS BONES, a name too hastily given by the vulgar to certain bones and parts of skeletons, of an enormous size, found in England and other places. Of all the numbers of these, which have been publicly shewn about as wonders in nature, not one but has proved, on examination, a bone of an elephant, or else of a whale; the first, however, is usually the case, as the bones of elephants are much more frequently found buried in the earth than those of the whale. We had not long ago the fore-fin of a whale, not fossile, but recent, taken clean from the skin, and shewn about London for the hand of a giant.

GIANTS CAUSEWAY, a name given by the common people of the county of Antrim in Ireland to a vast quantity of that kind of black marble, called basaltes, which stands in columns, and is natural to that marble, and runs out a great way into the sea.

The ignorance of the vulgar as to the nature of this stone has occasioned this great pile of it to be supposed artificial, and the work of giants, once inhabitants there. But the truth is, that the basaltes, in whatever part of the world it is found, is always naturally of this figure. Whoever considers this amazing series of columns in Ireland, will be soon convinced no human hands could have formed them, and will find an accuracy in their figures, greater than could have been expected from the most curious hand. The length of the several columns, and their joints so regularly placed in series, and the niceness of their articulations, by which no space or vacuity is left between, are wonderful.

The single columns, of which this mass of piles consists, are sometimes octangular, sometimes of seven, or fewer sides, but, generally, from three to nine sides; and, when examined, they are found just such as must necessarily be required in the places where they stand to fill up between others, so as to leave no vacuity. Each of these columns is composed of a great many series of joints, each of which is so well fitted to the place, that the joining appears only a crack or crevice in the stone: yet these are regularly articulated, there being always a ball on one part, and a socket in the other to receive it, so that the joints cannot slip off from one another. The triangular and square columns are fewer in number than the others, but they stand principally in the inner part of the large series, and are seldom seen, unless searched after by a curious eye. It is observable that every single pillar retains the same thickness, and angles, and sides, from top to bottom.

There are two other smaller and imperfect causeways to the left hand of the great one, and farther in the sea, a great number of rocks shew themselves at low water, which appear plainly all to consist of the same sort of columns. In going up the hill from the causeway there are found, in different places, a vast

number of the same columns; but these do not stand erect, but are laid slanting upwards in different angles and directions. Beyond this hill, eastward, also, at several distances, there stand a great number of the same pillars, placed straight and erect, and in clusters of different sizes. These are seen scattered, as it were, over the several parts of the hills.

An accurate account of the Giant's Causeway, and neighbouring columns of a similar nature, is given in Letters concerning the North Coast of the County of Antrim, from which the following particulars are taken:

"1. The pillars of the causeway are small, not very much exceeding one foot in breadth and thirty in length; sharply defined, neat in their articulation, with concave or convex terminations to each point. In many of the capes and hills they are of a larger size; more imperfect and irregular in their figure and articulation, having often flat terminations to their joints. At Fairhead they are of a gigantic magnitude, sometimes exceeding five feet in breadth and one hundred in length; oftentimes apparently destitute of joints altogether. Through many parts of the country, this species of stone is entirely rude and unformed, separating in loose blocks; in which state it resembles the stone known in Sweden by the name of *trappe*.

"2. The pillars of the Giant's Causeway stand on the level of the beach; from whence they may be traced through all degrees of elevation to the summit of the highest grounds in the neighbourhood.

"3. At the causeway, and in most other places, they stand perpendicular to the horizon. In some of the capes, and particularly near Ushet harbour, in the Isle of Baghery, they lie in an oblique position. At Doon point in the same island, and along the Balintoy shore, they form variety of regular curves.

"4. The stone is black, close, and uniform; the varieties of colour are blue, reddish, and grey; and of all kinds of grain, from extreme fineness to the coarse granulated appearance of a stone which resembles imperfect granite, abounding in crystals of schoerl chiefly black, though sometimes of various colours.

"5. Though the stone of the Giant's Causeway be in general compact and homogeneous; yet it is remarkable, that the upper joint of each pillar, where it can be ascertained with any certainty, is always rudely formed and cellular. The gross pillars also in the capes and mountains frequently abound in these air-holes through all their parts, which sometimes contain fine clay, and other apparently foreign bodies; and the irregular basaltes beginning where the pillars cease, or lying over them, is in general extremely honey-combed; containing in its cells crystals of zeolite, little morsels of fine brown clay, sometimes very pure steatite, and in a few instances bits of agate."

With respect to the promontory of Fairhead, above mentioned, it has not been much noticed till of late years: but Dr. Richardson is of opinion that it is by far the most superb colonnade of basaltic pillars yet discovered. For his account of it, with a plate, we refer to Nicholson's Journal, vol. v. p. 321; and for more on the subject of the Giant's Causeway, to Phil. Trans. abr. vol. ii. p. 511, &c. See also Phil. Trans. for 1808, or Retrospect of Discoveries, No. 19, for Dr. Richardson's Remarks on the basaltic surface of the counties of Derby and Antrim.

GI'ANTESS. *s.* (from *giant*.) A she-giant; a woman of unnatural bulk (*Howel*).

GI'ANTLIKE. GI'ANTLY. *a.* (from *giant* and *like*.) Gigantic; vast (*South*).

GI'ANTSHIP. *s.* (from *giant*.) Quality or character of a giant (*Milton*).

GIB, in mechanics. See CRANE.

GI'BBE. *s.* Any old worn-out animal (*Shakspeare*).

To GI'BBER. *v. n.* (from *jabber*.) To speak inarticulately (*Shakspeare*).

GI'BBERISH. *s.* Cant; the private language of rogues and gipsies; words without meaning (*Swift*).

GI'BBET. *s.* (*gibet*, French.) 1. A gallows; the post on which malefactors are hanged, or on which their carcases are exposed (*Cleaveland*). 2. Any traverse beams.

To GI'BBET. *v. n.* (from the noun.) 1. To hang or expose on a gibbet. (*Oldham*). 2. To hang on any thing going traverse (*Shakspeare*).

GI'BBIER. *s.* (French.) Game; wild fowl (*Addison*).

GIBBON (Edward), an elegant English writer, was born at Putney in 1737. He was sent, when very young, to the grammar-school at Kingston, from which he was removed, first to Westminster school, and afterwards to Magdalen college, Oxford. While at the university he contracted the principles of popery, which greatly alarmed his father, who, to recover him, sent him to a protestant minister at Lausanne, in Switzerland, where he did indeed renounce his new creed, but at the same time he abandoned christianity altogether. His first literary performance was an Essay on the Study of Literature, written in French, and afterwards translated into English by himself, and dedicated to his father in 1765. In 1744 he was chosen, under the auspicies of lord North, member of parliament for Liskeard in Cornwall. He was also appointed a lord of trade; and it need hardly be mentioned, that during the time of his being a senator, he was a constant supporter of administration. When that parliament expired he lost his seat and his place, and then retired to Lausanne, for which country he had a particular affection. It was there that he wrote the principal part of his History of the Decline and Fall of the Roman Empire, a work which will cause his name long to be remembered. Mr. Gibbon died in 1794, and since his death his posthumous works have been published in 2 vols. 4to. by his friend lord Sheffield.

Few writers were possessed of such popular talents as our historian. The acuteness of his penetration and the fertility of his genius have been seldom equalled, and scarcely ever surpassed. He seizes, with singular felicity, on

All the most interesting facts and situations, and these he embellishes with the utmost luxuriance of fancy and elegance of style. His periods are full and harmonious; his language is always well chosen, and is frequently distinguished by a new and peculiarly happy adaptation. His epithets, too, are in general beautiful and happy; but he is rather too fond of them. The uniform statement of his diction sometimes imparts to his narrative a degree of obscurity, unless he descends to the miserable expedient of a note, to explain the minuter circumstances. His style, on the whole, is much too artificial; and this gives a degree of monotony to his periods, which extends, we had almost said, to the turn of his thoughts.

A more serious objection is his attack upon Christianity; the loose and disrespectful manner in which he mentions many points of morality regarded as important on the principles of natural religion; and the indecent allusions and expressions which too often occur in the work. An attack upon Christianity is not censurable merely as such; it may proceed from the purest and most virtuous motives; but, in that case, the attack will never be carried on in an insidious manner, and with improper weapons; and Christianity itself, so far from dreading, will invite every mode of fair and candid discussion. Our historian, it must be confessed, often makes, when he cannot readily find, an opportunity to insult the Christian religion. Such, indeed, is his eagerness in the cause, that he stoops to the most despicable pun, or to the most awkward perversion of language, for the pleasure of turning the Scripture into ribaldry, or calling Jesus an impostor.

Yet of the Christian religion has Mr. Gibbon himself observed, that it "contains a pure, benevolent, and universal system of ethics, adapted to every duty and every condition of life." Such an acknowledgment, and from such a writer too, ought to have due weight with a certain class of readers, and of authors likewise, and lead them seriously to consider, how far it is consistent with the character of good citizens, to endeavour, by sly insinuations, oblique hints, indecent sneer, and profane ridicule, to weaken the influence of so *pure* and *benevolent* a system as that of Christianity, acknowledged to be admirably calculated for promoting the happiness of individuals, and the welfare of society.

Mr. Hayley, in his poetical Essay on History, after a splendid panegyric on the arduous labours of his friend, laments the irreligious spirit by which he was actuated.

> Think not my verse means blindly to engage
> In rash defence of thy profaner page!
> Though keen her spirit, her attachment fond,
> Base service cannot suit with Friendship's bond;
> Too firm from Duty's sacred path to turn,
> She breathes an honest sigh of deep concern,
> And pities Genius, when his wild career
> Gives Faith a wound, or Innocence a tear.
> Humility herself divinely mild,
> Sublime Religion's meek and modest child,
> Like the dumb son of Crœsus, in the strife,
> Where force assail'd his father's sacred life,
> Breaks silence, and with filial duty warm,
> Bids thee revere her parents hallowed form!

The part of the History which thus gave such offence to his own friend, as well as to the friends of the Christian religion in general, was the account which our historian has given of the progress and establishment of Christianity in the two last chapters of his first volume; in which he endeavours to prove that the wonderful triumph of that religion over all the established religions of the earth, was not owing to any miraculous attestations to its truth, but to five secondary causes which he enumerates; and that Christianity, of course, could not be of divine origin. Several answers appeared on this occasion, written, as we may naturally suppose, with different degrees of temper and ability. His principal opposers were Dr. Chelsum, Dr. Randolph, Dr. Watson (bishop of Llandaff), lord Hailes, Dr. White, Mr. Apthorpe, Mr. Davies, and Mr. Taylor, author of the Letters of Ben Mordecai. One of them only, Mr. Davies, who had undertaken to point out various instances of misrepresentation, inaccuracy, and even plagiarism in his account, did our historian condescend particularly to answer, and that in a tone of proud contempt and confident superiority. To this Mr. Davies replied; and it is but justice to observe, that his reply bears evident marks of learning, judgment, and critical acumen, and that he has convicted our author of sometimes quoting inaccurately to serve a purpose. At his other answerers Mr. Gibbon merely glanced, treating Dr. Watson, however, with particular respect; but his posthumous memoirs shew how much he felt the attacks made on him by lord Hailes, Dr. White of Oxford, and Mr. Taylor. To Dr. Priestley, who, in his History of the Corruptions of Christianity, threw down his gauntlets at once to Bishop Hurd and the historian of the Roman empire, and who presented the latter with a copy of his book, declaring, at the same time, that he sent it not as a gift but as a *challenge*, he wrote in such terms as produced a correspondence, which certainly added not to the honour of the socinian divine.

GIBBO'SITY. *s.* (*gibbosité*, Fr. from *gibbous.*) Convexity; prominence; protuberance (*Ray*).

GI'BBOUS. *a.* (*gibbus*, Latin.) 1. Convex; protuberant; swelling into inequalities (*Dryden*). 2. Crookbacked (*Brown*).

Gibbous leaf, in botany, hunched. Having both surfaces convex, by means of a very abundant pulp. (See Convex.) This term, when applied to a perianth, means only swelling out at bottom. Instances of this we have in the classes diadelphia and tetradynamia.

GIBBOUSNESS. *s.* (from *gibbous*.) Convexity; prominence (*Bentley*).

GI'BCAT. *s.* An old worn-out cat (*Shakspeare*).

To GIBE. *v. n.* (*gaber*, old French.) To sneer; to join censoriousness with contempt (*Swift*).

To GIBE. *v. a.* To reproach by contemptuous hints; to flout; to scoff; to ridicule; to sneer; to taunt (*Swift*).

GIBE. *s.* (from the verb.) Sneer; hint of contempt by word or look; scoff; act or expression of scorn; taunt (*Spectator*).

GIBEAH, a city in the tribe of Benjamin, lying north of Jerusalem about 20 or 30 furlongs, and built upon a hill, as its name imports.

GIBELINS, or GIBELLINS, a famous faction in Italy, opposed to another called the Guelphs. Those two factions ravaged and laid waste Italy for a long series of years; so that the history of that country, for the space of two centuries, is no more than a detail of their mutual violences and slaughters. The Gibelins stood for the emperor against the pope: but concerning their origin and the reason of their names we have but a very obscure account. The most probable opinion is that of Maimburg, who says, that the two factions of Guelphs and Gibelins arose from a quarrel between two ancient and illustrious houses on the confines of Germany, that of the Henries of Gibeling, and that of the Guelphs of Adorf.

GIBEON, a city seated on an eminence about 40 furlongs from Jerusalem northward, and not far from the city of Gibeah. This was the capital city of the Gibeonites, who took the advantage of Joshua's oath, and of that which the elders of Israel likewise swore to them, upon an artificial representation which they made of their belonging to a very remote country, and their desire of making an alliance with the Hebrews. Joshua (ix. 3, 4, & *seq*).

GI'BER. *s.* (from *gibe*.) A sneerer; a scoffer; a taunter (*Ben Jonson*).

GI'BINGLY. *ad.* (from *gibe*.) Scornfully; contemptuously (*Shakspeare*).

GI'BSTAFF. *s.* 1. A long staff to gage water, or to shove forth a vessel into the deep. 2. A weapon used formerly to fight beasts.

GI'BLETS. *s.* The parts of a goose which are cut off before it is roasted (*Dryden*).

GIBRALTAR, a town of Spain, in Andalusia, near a mountain of the same name, formerly called Calpe, which, and Mount Abyla on the opposite shore of Africa, were called the pillars of Hercules. Tarick, a general of the Moors, built a fortress here, which he called Gibel-Tarick, that is to say, Mount Tarick. Since that time a town has been built at the foot of this rock, which is strongly fortified. It can be approached only by a narrow passage between the mountain and the sea, across which the Spaniards have drawn a line, and fortified it, to prevent the garrison from having any communication with the country. It was formerly thought to be impregnable; but in 1704 it was taken by the confederate fleet, commanded by sir George Rooke; and has remained in the hands of the English ever since. It has been several times attacked by the Spaniards, who have always been unsuccessful: their last effort to recover it was made Sept. 13, 1782, with floating batteries, in which were mounted 212 brass cannons and mortars. General Elliot, who was governor of Gibraltar, had prepared a great number of red-hot balls against the attack: and these so effectually destroyed the floating batteries, that the Spaniards were greatly annoyed, and relinquished the enterprize. Lat. 36. 6 N. Lon. 5. 17 W.

GIBRALTAR, a town of South America, in the country of Terra Firma, and province of Venezuela, situated on the east coast of the lake of Maracaibo. In the environs of which is gathered the best cocoa of the province, and an excellent kind of tobacco grows, of high esteem in Old Spain. The air is exceedingly unwholesome in the rainy season, on which account the merchants and planters generally retire at that time to Maracaibo. It is defended by some fortifications, but was taken by the French and burned in the year 1679: fifty miles SSE. Maracaibo. Lon. 49. 50 W. Lat. 10. 4 N.

GIBSON (Edmund), bishop of London, was born at Knipe, in Westmoreland, in 1669. In 1686 he became a servitor at Queen's college, Oxford. In 1691 he published a new edition of William Drummond's Polemo Middiana, and James the V. of Scotland's Cantilena Rustica; the next year a translation into Latin of the Chronicon Saxonicum, with the Saxon original, and his own notes. He published also an edition of Camden's Britannia, in English, and the posthumous works of sir Henry Spelman, on the laws and antiquities of England. His writings recommended him to Dr. Tenison, archbishop of Canterbury, who made him his domestic chaplain, and greatly patronized him. In 1715, Tenison dying, Wake bishop of Lincoln succeeded to the primacy, and Gibson was raised to the see of Lincoln. In 1720 he was translated to London. He obtained an ample endowment from the crown, for the regular performance of divine service in the royal chapel at Whitehall, by a succession of clergymen, selected from both universities, and exerted himself at all times with great zeal in behalf of the church of England and vital christianity. He died in 1748, at the age of 79. Besides the above works he published several of his own, chiefly in divinity. His Codex Juris Ecclesiastici Angliacani is a work of much labour, and is highly celebrated.

GID, or GIDDINES, in veterinary medicine, a vertigo affecting the head in sheep, apes, and some other animals. Among sheep it commonly proceeds from their being too richly fed, and consequently it usually yields to a free employment of the lancet. The

farmers call this disease sturdiness, or the sturdy evil.

GI'DDILY, *ad.* (from *giddy*.) 1. With the head seeming to turn round. 2. Inconstantly; unsteadily (*Donne*). 3. Carelessly; heedlessly; negligently (*Shakspeare*).

GI'DDINESS. *s.* (from *giddy*.) 1. The state of being giddy or vertiginous. 2. Inconstancy; unsteadiness; mutability; changeableness (*Bacon*). 3. Quick rotation; inability to keep its place. 4. Frolick; wantonness of life (*Donne*).

GI'DDY. *a.* (ȝiɼiȝ, Saxon.) 1. Vertiginous; having in the head a whirl, or sensation of circular motion (*Tate*). 2. Rotatory; whirling (*Pope*). 3. Inconstant; mutable; unsteady; changeful (*Shakspeare*). 4. That causes giddiness (*Prior*). 5. Heedless; thoughtless; wild (*Rowe*). 6. Tottering; unfixed (*Shakspeare*). 7. Intoxicated; elated to thoughtlessness; overcome by any overpowering incitement (*Shakspeare*).

GI'DDYBRAINED. *a.* (*giddy* and *brain*.) Careless; thoughtless (*Otway*).

GI'DDYHEADED. *a.* Without steadiness or constancy (*Burton*).

GI'DDYPACED. *a.* Moving without regularity (*Shakspeare*).

GIDEON, in Scripture history, the son of Joash, of the tribe of Manasseh. He was chosen judge of Israel in the year of the world 2759, and died in 2768.

GIFFORD (Dr. Andrew), an English baptist minister, was born in 1700. He was assistant librarian many years at the British Museum, and died in 1784, bequeathing his library to the baptist academy at Bristol. Dr. Gifford was a learned antiquary and a pious divine.

GIFT. *s.* (from *give*.) 1. A thing given or bestowed (*Matthew*). 2. The act of giving (*Milton*). 3. The right or power of bestowing (*South*). 4. Oblation; offering (*Tobit*). 5. A bribe (*Deuteronomy*). 6. Power; faculty (*Shakspeare*).

Gift, *Donum*, in law, is a conveyance which passeth either lands or goods, and is of a larger extent than a grant, being applied to things moveable and immoveable; yet as to things immoveable, when taken strictly, it is applicable only to lands and tenements given in tail; but *gift* and *grant* are too often confounded.

New-Year's Gifts, presents made on new-year's day, as a token of the giver's good will, as well as by way of presage of a happy year. This practice is very ancient, the origin of it among the Romans being referred to Tatius king of the Sabines, who reigned at Rome conjointly with Romulus, and who having considered as a good omen a present of some sprigs of vervain gathered in a wood consecrated to Strenia the goddess of strength, which he received on the first day of the new year, authorised this custom afterwards, and gave to these presents the name of Strenæ.

GI'FTED. *a.* (from *gift*.) 1. Given; bestowed (*Milton*). 2. Endowed with extraordinary powers (*Dryden*).

GIG. *s.* (Etymology uncertain.) 1. Any thing that is whirled round in play. 2. (*gigia*, Islandick.) A fiddle: out of use. 3. A light open carriage, drawn by a single horse.

GIGA, or Jig, in music, an airy brisk movement generally written in the time of $\frac{6}{8}$.

Giga, a small island on the W. coast of Scotland, between the isle of Skye and the peninsula of Cantyre, in Argyleshire, in which county it is included. The inhabitants annually export a considerable quantity of grain.

GIGANTES, the rebel giants.

GIGA'NTIC. *a.* (*gigantes*, Latin.) Suitable to a giant; big; bulky; enormous (*Pope*).

To GI'GGLE. *v. n.* (*gichgelen*, Dutch.) To laugh idly; to titter (*Garrick*).

GI'GGLER. *s.* (from *giggle*.) A laugher; a titterer (*Herbert*).

GI'GLET. *s.* (ȝeaȝl, Saxon.) A wanton; a lascivious girl: out of use (*Shakspeare*).

GI'GOT. *s.* (French.) The hip-joint.

GIGS, a term in the stable, but now almost obsolete, for what are now called flaps, a kind of flaccid fleshy enlargement on each side a horse's jaw, which, in his mastication, frequently falling between the grinders, is productive of pain, and prevents the horse from eating. If long and thin, they may be completely taken off by a pair of scissors, and the wounds washed with a strong solution of alum in water: if they are too fleshy for this mode of extirpation, they may be slightly scarified with a bistory, or abscess lancet.

GIHON, in ancient geography, one of the rivers of Paradise; according to Wells, the eastern branch of the Euphrates, into which it divides after its conjunction with the Tigris.

GILBERT (William), a learned physician, who discovered several of the properties of the loadstone, was born at Colchester, in 1540, and educated at Cambridge, but took his degree of M.D. abroad. On his return to England he was elected a fellow of the college of physicians in London in 1573, and practised in the metropolis with great success and repute, so that queen Elizabeth appointed him her physician in ordinary. In 1600 he published a work, intitled De Magnete, magneticisque Corporibus, and de magno Magnete tellure, Physiologia nova. He died in 1603. (*Watkins*).

Gilbert (Sir Humphrey), an able navigator, who took possession of Newfoundland in the name of queen Elizabeth; but was unsuccessful in an attempt he made to plant a colony on the continent of America. He contended for the existence of a N.W. passage to the Indies, in a book written for that purpose. He died in 1583.

GILBERTIA. In botany, a genus of the class decandria, order monogynia. Calyx four or five-toothed; corol four or five-petalled; nectary cylindrical, truncate; anthers inserted into the margin of the nectary; capsule four-

celled; the cells about one-seeded. Four species; natives of the isle of Bourbon.

GILBERTINES, an order of religious, thus called from St. Gilbert of Sempringham in the county of Lincoln, who founded the same about the year 1148; the monks of which observed the rule of St. Augustin, and were accounted canons: and the nuns that of St. Benedict. The founder of this order erected a double monastery, or rather two different ones, contiguous to each other, the one for men, the other for women, but parted by a very high wall. St. Gilbert himself founded 13 monasteries of this order, viz. four for men alone, and nine for men and women together, which had in them 700 brethren and 1500 sisters. At the dissolution there were about 25 houses of this order in England and Wales.

GILBOA, mountains of Samaria, stretching out from west to east, on the confines of the half tribe of Manasseh, and of the tribe of Issachar; and to the south part of the valley of Jezreel, beginning westward at the city of Jezreel, situated at the foot of these mountains, reaching almost quite to the Jordan, lying at the distance of six miles from Scythopolis: famous for the death of Saul and his son Jonathan, and the defeat of the Israelites by the Philistines.

GILD. See GUILD.

To GILD. *v. a.* pret. *gilded* or *gilt*. (ȝildan, Saxon.) 1. To overlay with thin gold (*Spenser*). 2. To cover with any yellow matter (*Shak.*). 3. To adorn with lustre (*Pope*). 4. To brighten; to illuminate (*South*). 5. To recommend by adventitious ornaments (*Shakspeare*).

GI'LDER. *s.* (from *gild.*) 1. One who lays gold on the surface of any other body (*Bacon*). 2. A coin, from one shilling and sixpence, to two shillings (*Shakspeare*).

GI'LDING. *s.* (from *gild.*) Gold laid on any surface by way of ornament (*Bacon*).

GILDING (Art of). See GOLD.

GILEAD, in Scripture history, the son of Machir, and grandson of Manasseh, had his inheritance allotted him in the mountains of Gilead, whence he took his name. See Genesis xxxi, xxxvii, &c.

GILEAD (Balm of). See DRACOCEPHALUM.

GILEAD (Balm of, Tree). See AMYRIS.

GILL (John, D.D.), a protestant dissenting minister of the baptist denomination, and the son of Edward and Elizabeth Gill, was born at Kettering in Northamptonshire, November 23, 1697. His sentiments, as a divine, were throughout Calvinistic: "And perhaps no man (says the Rev. Mr. Toplady, a minister in the church of England), since the days of Austin, has written so largely in defence of the system of grace; and certainly no man has treated that momentous subject, in all its branches, more closely, judiciously, and successfully." He died at Camberwell, October 14, 1771, aged 73 years 10 months and 10 days. In 1718 the doctor married Mrs. Elizabeth Negus, by whom he had many children, two of whom only survived him. Mrs. Gill died in 1764. His works are, A Commentary on the Old and New Testament, in 9 vols. folio. A Body of Divinity, in 3 vols. quarto. The Cause of God and Truth, 4 vols. octavo. A Treatise concerning the Prophecies of the Old Testament respecting the Messiah. A Dissertation on the Antiquity of the Hebrew Language, Letters, Vowel-Points, and Accents. Sermons on the Canticles, folio; besides a great number of sermons and controversial pieces on different subjects. The doctor was a man of considerable labour and industry; his works, though somewhat tedious and dull, exhibit marks of sound piety and a good understanding; but we do not now recollect a single trait of genius.

GILLS, in ichthyology, the respiratory organ of fishes, anatomically denominated branchiæ, and in many respects very closely assimilating to the lungs of quadrupeds. The gills or branchiæ lie in two large openings, one on each side of the head. Their form is semicircular, and terminate with a fringe of beautiful fibrillæ, resembling, in their form, the vane of a feather. They are perpetually subject to an alternating action from the pressure of the water, nor is any red blood to be discovered where such alternate pressure does not exist. Over these gills is a large flap, or valve, allowing a communication externally, by which the water fishes are compelled to take into their mouths with their food finds an exit without passing into the stomach. The blood is collected from the infinite ramification of the small branchial arteries, by a vast number of small veins, gradually communicating and enlarging, which at length, instead of uniting to form a pulmonary vein, as in quadrupeds, and return the blood to the heart, unite and form an *aorta descendens*, which, without the intervention of the contraction or dilation of the heart, circulates the blood through every part of the system, to be returned to the heart by the corporeal veins alone. The heart of fishes, which is single instead of double, is, hence, a mere pulmonary and not a corporeal heart.

GILLS, in botany. See LAMEL.

GILL, a measure of capacity, containing a quarter of an English pint.

GILL, contracted from Gillian, is an appellation for a woman in ludicrous language.

GILL-COVER, in ichthyology, the bony or cartilaginous substance placed on the membrane that covers the gills.

GILLIFOWER. GILLIFLOWER (Clove), in botany. See DIANTHUS.

GILLIFLOWER (Queen's), in botany. See HESPERIS.

GILLIFLOWER (Stock), in botany. See CHEIRANTHUS.

GILOLO, a large island of the East Indies. It lies directly under the equinoctial line, in lon. 130. 0 E. The inhabitants are fierce and cruel.

GILPIN (Bernard), an English divine of extraordinary merit, was born at Kentmire in

Westmoreland in 1513, and educated at Queen's college, Oxford, where he took his degrees in arts, and was chosen a fellow. On the completion of the foundation of Christ church college by Henry VIII. he was chosen one of its first masters. In the reign of Edward VI. his zeal for popery led him to hold a dispute with Peter Martyr, the result of which was his own conversion to the protestant religion. Soon after this he was presented to the living of Norton in the diocese of Durham, and by the advice of Tonstal, bishop of that diocese, who was his uncle, he went abroad, that he might consult foreign divines, taking with him a MS. of that prelate on the eucharist to get printed. After the accession of queen Mary, Tonstal being restored to his see, he offered a valuable living to Gilpin, who declined it from scruples of conscience. Soon after he went to Paris, where the first thing he did was to print his uncle's book. In 1556 Gilpin returned to England, a little before the death of queen Mary. His uncle conferred on him the archdeaconry of Durham, with the rectory of Easington annexed. Although the persecution still raged against the protestants he preached openly against vice of every kind, but more particularly in the clergy, and amongst other things, against pluralities and non-residence, by which he brought such a persecution on himself that he was twice formally accused before his bishop, who, however, found means to protect him. But he was so embarrassed with the malice of his enemies, that he resigned the archdeaconry and retired to Houghton-le-spring, the living of which becoming vacant was given to him by his uncle. Although he now forbore to attack the clergy, they could not forgive him, and he was accused before Bonner, bishop of London, who ordered him to be apprehended. He began without delay to prepare himself for martyrdom, and, having desired his house steward to provide him with a long garment, in which he proposed to go to the stake, he set out for London. But the death of queen Mary, the news of which he received on the road, saved him in this extremity. He returned to Houghton, where his parishioners received him with every token of respect and satisfaction. When the popish bishops were deprived, a congé d'elire was sent to Carlisle to elect him bishop of that see; but he declined the honour, and the following year refused the provostship of Queen's college. He endeared himself to all by his munificence, charity, and virtuous life. His death was hastened by an accident. He was thrown down in the market-place at Durham by an ox, and extremely hurt; and though he got abroad again after a long confinement, he never perfectly recovered. He died in 1583, in the 66th year of his age. (*Watkins*).

GILT. *s.* (from *gild.*) Golden show; gold laid on the surface of any matter (*Shakspeare*).

GILT. The participle of *gild.*

GILTHEAD, in ichthyology. See SPARUS.

GIM. *a.* (An old word.) Neat; spruce.

GIMBOLS, are the brass rings by which a sea-compass is suspended in its box that usually stands in the binacle.

GI'MCRACK. *s.* (ludicrously formed from *gin.*) A slight or trivial mechanism (*Prior*).

GI'MLET. *s.* (*gibelet, guimbelet,* French.) A borer with a screw at its point (*Moxon*).

GI'MMAL. *s.* (*gimellus,* Latin.) Some little quaint devices of machinery (*Hanmer*).

GI'MMER. *s.* Movement; machinery (*More*).

GIMP. *s.* A kind of silk twist or lace.

GIN. *s.* (from *engine.*) 1. A trap; a snare (*Ben Jonson*). 2. Any thing moved with screws, as an engine of torture (*Spenser*). 3. A pump worked by rotatory sails (*Woodward*). 4. (contracted from GENEVA.) The spirit drawn by distillation from juniper-berries.

GIN, in mechanics, an engine for driving piles. See PILE-ENGINE.

GINGEE, a town of Asia, in the peninsula of Hindustan, and on the coast of Coromandel. It is a large town, well peopled, and strong both by art and nature, being seated on a mountain, whose top is divided into three points, on each of which is a castle. The Great Mogul in 1690 began a siege, which continued three years, to no purpose. It is 33 miles W. of Pondicherry. Lat. 11. 42 N. Lon. 10. 13 E.

GINGER, in botany. See AMOMUM.

GI'NGERBREAD. *s.* (*ginger* and *bread.*) A kind of farinaceous sweetmeat made of dough, like that of bread or biscuit, sweetened with treacle, and flavoured with ginger and some aromatic seeds (*Swift*).

GI'NGERLY. *ad.* Cautiously; nicely (*Shakspeare*).

GI'NGERNESS. *s.* Niceness; tenderness.

GINGIDIUM, in botany. See CHÆREFOLIUM.

GINGIRO, or ZINDERO, a small territory of Africa, to the south of Abyssinia; being separated from it by the river Zebee, by which it is also almost entirely surrounded. This river is extremely large, having more water than the Nile, and being much more rapid; so that during the rainy season it would be altogether impassable, were it not for the large rocks which are in its channel. The extreme difficulty which occurs in passing this river, however, is the means of preserving the kingdom of Gingiro, which could otherwise be conquered in a single season by the Galla.

In this kingdom every thing is conducted, or pretended to be conducted, by magic; and all those slaves, which in other African countries are sold to Europeans, are here sacrificed to the devil, human blood being a necessary part in all their accursed solemnities. "How far (says Mr. Bruce) this reaches to the southward, I do not know; but I look upon this to be the geographical bounds of the reign of the devil on the north side of the equator in the peninsula of Africa."

GINGIVÆ. (*gingivæ,* from *gigno,* to beget, because the teeth are, as it were, born in them.) The gums. See GUMS.

GINGI'VAL. *a.* (*gingiva,* Latin.) Belonging to the gums (*Holder*).

To GI'NGLE. *v. n.* 1. To utter a sharp clattering noise (*Pope*). 2. To make an affected sound in periods or cadence.

To GI'NGLE. *v. a.* To shake so that a sharp shrill clattering noise should be made (*Pope*).

To GI'NGLE. *s.* (from the verb.) 1. A shrill resounding noise. 2. Affectation in the sound of periods.

GI'NGLYMOID. *a.* (γιγγλυμος, a hinge, and ειδος.) Resembling a ginglymus; approaching to a ginglymus.

GINGLYMUS. (*ginglymus*, from γιγγλυμος, a hinge.) The hinge-like joint. A species of diarthrosis or moveable connexion of bones, which admits of flexion and extension, as the knee-joint, &c.

GINKSO, in botany. See MAURITIA.

GI'NNET. *s.* (γιννος.) A nag; a mule; a degenerated breed.

GINONIA. In botany, a genus of the class dodecandria, order monogynia. Calyx six-cleft; petals six: capsule one-celled, four-valved, many seeded. One species; a myrtle-form shrub of Cuba, with leaves opposite, lanceolate, entire, glabrous; peduncles axillary and terminal, one-flowered.

GINSENG. (*ginseng*, Indian.) The plant from which this root is obtained is the panax quinquefolium; foliis ternis quinatis, of Linnéus. A genus of the class polygamia, order dioecia. It is imported into this country scarcely of the thickness of the little finger, about three or four inches long, frequently forked, transversely wrinkled, of a horny texture, and both internally and externally of a yellowish white colour. To the taste it discovers a mucilaginous sweetness, approaching to that of liquorice, accompanied with some degree of bitterness, and a slight aromatic warmth. The Chinese ascribe extraordinary virtues to the root of gingseng, and have no confidence in any medicine unless in combination with it. In Europe, however, it is very seldom employed. See PANAX.

GIOIA (Flavio), of Amalfi in the kingdom of Naples, the celebrated mathematician; who, from his knowledge of the magnetic powers, invented the mariner's compass, by which the navigation of the Europeans was extended to the most distant regions of the globe: before this invention, navigation was confined to coasting. The king of Naples being a younger branch of the royal family of France, he marked the north point with a fleur de lis, in compliment to that country. It is said the Chinese knew the compass long before; be this as it may, the Europeans are indebted to Gioia for this invaluable discovery. He flourished A.D. 1300.

GIORGIONE, so called from his comely aspect, was an illustrious Venetian painter, born in 1478. He received his first instructions from Giovanni Bellino; but studying afterwards the works of Leonardo da Vinci, he soon surpassed them both, being the first among the Lombards who found out the admirable effects of strong lights and shadows. Titian became his rival in this art, and was so careful in copying the life, that he excelled Giorgione in discovering the delicacies of nature, by tempering the boldness of his colouring. The most valuable piece of Giorgione in oil is that of Christ carrying his cross, now in the church of San Rovo in Venice; where it is held in great veneration. He died young of the plague in 1511.

GIOTTO, an eminent painter, sculptor, and architect, was born near Florence in 1276, and was a disciple of Cimabue, whom he greatly excelled. He was chiefly admired for his works in mosaic, the best of which is a ship over the grand entrance of St. Peter's church at Rome. At Florence is the famous mosaic of the death of the Virgin, which was wonderfully admired by Michael Angelo. He died in 1336.

GIOVENAZZO, a town of Naples, in Terra di Bari, with a castle. It is seated on a mountain near the sea. Lat. 41. 26 N. Lon. 16. 50 E.

To GIP. *v. a.* To take out the guts of herrings.

GI'PSY. *s.* (corrupted from *Egyptian.*) 1. A vagabond who pretends to foretell futurity, commonly by palmestry or physiognomy. (See GYPSY.) 2. A reproachful name for a dark complexion (*Shakspeare*). 3. Name of slight reproach to a woman.

GIRALDI (Lilio Gregorio), an eminent writer, was born at Ferrara in 1479. He resided some time at Rome in favour with some eminent men at that court, but after losing his patrons he fell into poverty, and returned to his native place, where he died in 1552. The most esteemed of his works is, Historia de Diis Gentium, and it is among the last he wrote.

GIRALDI (John Baptist Cintio), an Italian poet, was born at Ferrara in 1504. After going through a course of classical and philosophical study, he applied to physic, in which he took his doctor's degree. He was for some time secretary to the duke of Ferrara, but afterwards accepted the professorship of rhetoric at Pavia. Being greatly afflicted with the gout he quitted the chair, and retired to his native place, where he died in 1573. His works are chiefly tragedies, an edition of which was published at Venice, in 1583, in 8vo.

GIRARD (Gabriel), author of the celebrated work, intitled, Synonymes François, &c. was almoner to the duchess de Berry, and the king's interpreter for the Russian and Sclavonian languages. He also wrote a work, intitled Principes de la Langue Françoise; but this is inferior to the former, which indeed exhibits great subtlety of understanding and refinement of taste. The abbé Girard died in 1748, at the age of 70.

GIRARDON (Francois), a French sculptor and architect, was born at Troyes in 1628. After studying under Maziere and Anguier, he was sent to Rome by Louis XIV. to perfect himself in his art, and succeeded le Brun as inspector-general of sculpture. The chief works of this artist are the Mausoleum of cardinal de Richelieu, in the church of the Sor-

bonne; the equestrian statue of Louis XIV.; and the rape of Proserpine, in the gardens of Versailles. He died at Paris in 1715.

GIRASSE, in mastiology. See CAMELOPARDALIS.

To GIRD. *v. a.* pret. *girded* or *girt.* (ȝẏꞃdan, Saxon.) 1. To bind round (*Maccabees*). 2. To put on so as to surround or bind (*Swift*). 3. To fasten by binding (*Milton*). 4. To invest (*Shakspeare*). 5. To dress; to habit; to clothe (*Ezekiel*). 6. To cover round as a garment (*Milton*). 7. To furnish; to equip (*Milton*). 8. To enclose; to encircle (*Milton*). 9. To reproach; to gibe (*Shakspeare*).

To GIRD *v. n.* To break a scornful jest; to gibe; to sneer (*Shakspeare*).

GIRD. *s.* (from the verb.) A twitch; a pang (*Tillotson. Goodman*).

GIRDERS, in architecture, some of the largest pieces of timber in a floor. Their ends are usually fastened into summers and breast-summers, and joists are framed in at one end to the girders. The size of girders and summers, upon the rebuilding of London, were ordained by act of Paaliament, to be in length from ten to twenty-six feet, in breadth from eleven to seventeen inches, and in depth from eight to fourteen inches. It was also ordained by the same statute, that no girder or summer should be less than ten inches in the wall, and that their ends should be laid in loam; as also that they be of good hearty oak, as free from knots as may be, because that will be the least subject to breaking, and may with more safety be relied on in this cross and transverse work.

A scantling of fir 10 feet in length, 8 inches in breadth, and 10 high, is found to be sufficiently strong for all practical purposes; the following tables contain the dimensions of other girders, of very nearly equal strength, allowing the relative strength of oak and fir to be as stated under the article BEAM.

FIR.

Length.	Breadth.	Height.
10*f.*	8*i.*	10*i.*
12	8	11
14	9	11·1
16	9	11·9
18	10	12
20	10	12·6
22	11	12·6
24	11	13·2

OAK.

Length.	Breadth.	Height.
10*f.*	7*i.*	10*i.*
12	7	11
14	8	11·1
16	8	11·9
18	9	11·9
20	9	12·5
22	10	12·5
24	10	13·

GI'RDLE. *s.* (ȝẏꞃdel, Saxon.) 1. Any thing drawn round the waist, and tied or buckled (*Brown*). 2. Enclosure; circumference (*Shakspeare*). 3. The zodiack (*Bacon*).

GIRDLE (Maidens' or Virgins'). It was the custom among the Greeks and Romans for the husband to untie his bride's girdle. Homer, lib. xi. of his Odyssey, calls the girdle παρθενιην ζωνην, *maid's girdle*. Festus relates that it was made of sheep's wool, and that the husband untied it in bed. The poets attribute to Venus a particular kind of girdle called cestus, to which they annexed a faculty of inspiring the passion of love.

To GI'RDLE. *v. n.* (from the noun.) 1 To gird; to bind as with a girdle (*Shakspeare*). 2. To inclose; to shut in; to environ (*Shakspeare*).

GIRDLE (Order of the). The order of Cordeliers.

GI'RDLEBELT. *s.* (*girdle* and *belt.*) The belt that encircles the waist (*Dryden*).

GI'RDLER. *s.* (from *girdle.*) A maker of girdles.

GIRE. *s.* (*gyrus*, Latin.) A circle described by any thing in motion.

GIRGASHITES, or GERGESENES, an ancient people of the land of Canaan, whose habitation was beyond the sea of Tiberias, where we find some footsteps of their name in the city of Gergesa, upon the lake of Tiberias.

GIRGE, a town of Egypt, the capital of the Said, situate near the left bank of the Nile. It is about three miles in circumference. Lat. 26 30 N. Lon. 31. 22 E.

GIRGENTI, a town of Sicily, which occupies part of the site of the ancient Agrigentum. It has only one street fit for carriages. It is inhabited by 15,000 persons, but has no remarkable buildings or works of art that deserve mention; the only antiquities to be seen were a Latin inscription of the time of the Antonines, as is pretended, relative to some association between Agrigentum and Lilybæum; and a piece of ancient masonry in the foundations of a church pretended to be the remains of a temple of Jupiter. At some distance, on the old ground in the vale, stands

the cathedral, a clumsy building patched up by barbarous architects with various discordant parts. This church is enriched with no works of modern painters or sculptors that claim any title to praise; but the baptismal font is made out of an ancient sarcophagus faced with very beautiful basso relievo. This see is the richest in Sicily, but has the character of being less enlightened and polished than the rest of the island. It is seated on a hill, near the river St. Blaise. Lat. 37. 24 N. Lon. 13. 26 E.

GIRL. *s.* (*karlinna*, Icelandick, a woman.) A young woman, or female child (*Shak.*).

GIRL (Invisible). The name given to an ingenious acoustic apparatus, by which sounds issue from a small hollow ball, as if they proceeded from a girl within it.

There have been two communications with a view to explain the secret of the invisible girl, published in Nos. 65 and 66 of the Philosophical Journal. The author of the first of these communications, having observed that the secret of the invisible girl has not yet been published, here presents the explanation of it given by Mr. Millington of Chancery-lane, in his Philosophical Experiments.

The visible part of the apparatus connected with the invisible girl is this:—First, a mahogany frame not very unlike a bedstead, having at the corners four upright posts, about five feet high, which are united by a cross rail near the top, and two or more cross rails near the bottom, to strengthen the frame: these cross rails are about four feet in length. The frame thus constructed stands upon the floor, and from the top of each of the four pillars springs one of four strong bent brass wires, converging towards the top, where they are secured by a crown and other ornaments. From these four wires a hollow copper ball, of a foot in diameter, is suspended by slight ribbons so as to cut off all possible communication with the frame. This globe is supposed to contain the invisible being, as the voice apparently proceeds from the interior of it: and for this purpose it is equipped with four trumpets, placed round it in an horizontal direction, and at right-angles to each other, the trumpet mouths coming to within about half an inch of the respective cross rails of the frame surrounding them.

When a question is proposed, it is asked from any side of the frame, and spoken into one of the trumpets, and an answer immediately proceeds from all the trumpets, so loud as to be distinctly heard by an ear addressed to any of them, and yet so distant and feeble that it appears as if coming from a very diminutive being. In this the whole of the experiment consists, and the variations are, that the answer may be returned in several languages, a kiss will be returned, the breath producing the voice may be felt, and songs are sung, accompanied by the piano-forte, &c.

In this illusion the sound is really conveyed by a tube, in a manner similar to the old and well-known contrivance of the speaking-bust; the invisible girl only differing in this one circumstance, that an artificial echo is produced by means of the trumpets and hollow globe, in consequence of which the sound no longer appears to proceed in its original direction, but is completely reversed. In the present case the beginning of the tube is in one of the hand-rails just opposite the centre of the mouth of one of the trumpets, the orifice being concealed by reeds or other mouldings: the tube itself, which may be about half an inch in diameter, runs through half the hand-rail, then down one of the corner posts, and from thence under the floor till it reaches a large deal case almost similar to an inverted funnel, along the side of which it rises till it comes nearly into contact with the ear of the confederate, who with a piano-forte, &c. are concealed in this case. Any question asked by a voice directed into one of the trumpets will be immediately reflected back from the concave interior surface of the globe to the orifice of the tube, along which it will be conveyed so as to be distinctly heard by the person in the deal case; and the answer returned, or a song, or a tune from the instrument, will in consequence of a similar reflection be distinctly heard at the mouths of the trumpets, but no where else; and there it will appear to come precisely from the interior of the globe. A small hole, closed with glass, is left through the deal case and side wall of the room, by means of which the concealed person has an opportunity of observing and commenting upon any circumstance which may take place in the room.

The author of the second communication confirms the former explanation of the invisible girl, except as to the manner in which it is supposed she saw the company, for he carefully examined the room of a similar exhibition at Bristol, and ascertained that there could be no such aperture as is above spoken of. In this exhibition there was a loose rail with eight legs; seven of which the operator always removed from their places to blunt suspicion; but the eighth was always found immoveably fixed, and that was always the leg towards the closet where the lady sat. Here, too, the rail was covered opposite the mouth of the trumpets with stained paper; but the vibration might be felt on the holes when any one answered, and peoples' hands had a little indented them by accidental pressure.

Notwithstanding the affirmation of the writer of the second article above, that there could be no aperture for the lady to see through, in the room at Bristol, we are inclined to think there has been some such orifice in other exhibitions of this kind in different parts of the united kingdom. If such an aperture was fixed at the height of ten or twelve feet, and the concealed seat of the confederate elevated accordingly, it would give her considerable advantage in seeing what is going forward in the room, at the same time that it would be extremely easy, by means of some artificial ornament attached to the wall, (of which there might be several alike) to prevent the possibility of discovering any such hole. Or without elevating the seat of the confederate, two or

three plane mirrors properly disposed, one of them horizontally just above the top of the room and disguised by a feigned ventilator, or an open-work ornament, would give her a still more complete view of every thing in the exhibition-room, and that, if it were thought proper, pourtrayed on a glass lying before her upon her musical instrument.

The general method of disposing such mirrors must be very obvious to those who are merely acquainted with the rudiments of Catoptrics; and others will see it explained in Montucla's and similar books of Philosophical Recreations, where a jealous husband is taught how to see what his wife is doing in another apartment; or a person to see those who approach the door of his house, without looking out at the window, or without having a front at which to look out.

The method of managing this exhibition, as generally performed in England, is doubtless pointed out in these letters: various other methods, all depending upon the simple principle of reflected sounds, are either described or suggested in the good father Kircher's entertaining work intitled Musurgia Universalis. (*Retrospect of Discoveries, No.* 9.)

GI'RLISH. *s.* (from *girl.*) Suiting a girl; youthful (*Carew*).

GI'RLISHLY. *ad.* In a girlish manner.

To GIRN. *v. n.* It seems to be a corruption of *grin.*

GIRONDE, a department of France, which includes part of the late province of Guienne. It lies on both sides the Garonne. Its chief town is Bourdeaux.

GIRONNA, an ancient city of Spain, in Catalonia, with a bishop's see. It is seated on a hill, by the side of the river Onhall. Lat. 42. 0 N. Lon. 2. 52 E.

GIRT. The part. pass. of *gird.*

To GIRT. *v. a.* (from *gird*) To gird; to encompass; to encircle: not proper (*Thomson*).

GIRT, in the measuring of timber, is the circumference of a tree, though some use this word for the fourth part of the circumference only, on account of the use made of it. The square of the fourth part is considered as equal to the area of the section of the tree, which square therefore, multiplied by the length of the tree, is accounted the solid content. This content is about one fourth less than the true quantity, being nearly equal to what it will be after the tree is hewn square, and is probably intended to make an allowance for the squaring the tree.

GIRT, in naval affairs, the situation of a ship which is moored so tight by her cables as to be prevented turning to any change of the wind or tide, to the current of which her head would otherwise be directed. The cables, to produce this, are extended by a strong application of mechanical powers within the ship, so that as she veers, or endeavours to swing about, her side bears upon one of the cables, which interrupts her in the act of traversing.

GIRTANNER (Dr. Christopher), a celebrated chemist, was born in Swisserland, about 1760. He removed into Germany early in life, and was the first chemist there who adopted the new chemical doctrine of the French. In 1791, he published at Berlin a work intitled The New Chemical Nomenclature, in the German language (*Neue Chemische Nomenklatur fur die Deutsche sprache*); and the next year The Elements of the Antiphlogistic Chemistry. He was the author also of several other works, and of a great many papers on chemistry and other subjects, printed in different journals. He died at Gottingen, in an apopletic fit, May 17th, 1800, in the 40th year of his age. (*Phil. Mag.*)

GIRTH-LINE, a rope passing through a single block on the head of the lower masts to hoist up the rigging, and the persons employed to place the rigging and cross-trees on the mast heads. The girth-line is the first rope employed to rig a ship, after which it is removed till the ship is to be unrigged.

GIRTHS, horse swathes made from woollen web, and used for keeping the saddle in a proper position. These, to prevent galling, should be made of elastic, and not of tight-wove web, which, being rigid and harsh, is likely to lacerate during the heat and friction of a long chase. Observation should be made that girths are never too short, so as to have the buckle below the pad of the saddle, either on one side or the other; for want of attention to which, warbles, sitfasts, and wounds, very frequently ensue.

To GIRTH. *v. a.* To bind with a girth.

GISARMES, in our old writers, a halbert.

GISBOROUGH, a town in the N. Riding of Yorkshire, with a market on Mondays. It is noted for being the first place where alum was made. Lat. 54. 35 N. Lon. 0. 55 W.

GISBURN, a town in the W. Riding of Yorkshire, with a market on Mondays. Lat. 53. 55 N. Lon. 2. 22 W.

To GISE *Ground. v. a.* Is when the owner of it does not feed it with his own stock, but takes other cattle to graze (*Bailey*).

GI'SLE. Among the ancient Saxons, signifies a pledge: thus, *Fredgisle* is a pledge of peace; *Gislebert* an illustrious pledge (*Gibson*).

GISON, in Jewish antiquity, a wall about breast high, made round the temple, and the altar of burnt sacrifices, to keep the people at a proper distance.

GITTITH, a Hebrew word occurring often in the Psalms, and generally translated winepresses.

To GIVE. *v. a.* pret. *gave*; part. pass. *given.* (ʒifan, Saxon.) 1. To bestow; to confer without any praise or reward (*Hooker*). 2. To transmit from himself to another by hand, speech, or writing; to deliver (*Burnet*). 3. To put into one's possession; to consign; to impart; to communicate (*Temple*). 4 To pay as a price or reward, or in exchange (*Shakspeare*). 5. To yield; not to withhold (*Bacon*). 6. To quit; to yield as due (*Ecclus*). 7. To confer; to impart (*Bramhall*). 8. To expose; to yield without intention (*Dryden*). 9. To grant; to allow (*Atterbury*). 10. To

yield; not to deny (*Rowe*). 11. To afford; to supply (*Hooker*). 12. To empower; to commission (*Pope*). 13. To enable (*Hooker*). 14. To pay (*Shakspeare*). 15. To utter; to vent; to pronounce (*Swift*). 16. To exhibit; to show (*Hale*). 17. To exhibit as the product of a calculation (*Arbuthnot*). 18. To do any act of which the consequence reaches others: *he gave no offence* (*Burnet*). 19. To exhibit; to send forth as odours from any body (*Bacon*). 20. To addict; to apply (*Sidney*). 21. To resign; to yield up (*Herbert*). 22. To conclude; to suppose (*Garth*). 23. *To* GIVE *away*. To alienate from one's self; to make over to another (*Taylor*). 24. *To* GIVE *back*. To return; to restore. 25. *To* GIVE *forth*. To publish; to tell. 26. *To* GIVE *the hand*. To yield pre-eminence, as being subordinate or inferiour. 27. *To* GIVE *over*. To leave; to quit; to cease (*Hooker*). 28. *To* GIVE *over*. To addict; to attach to (*Sidney*. *Grew*.) 29. *To* GIVE *over*. To conclude lost (*Arbuthnot*). 30. *To* GIVE *over*. To abandon (*Hudibras*) 31. *To* GIVE *out*. To proclaim; to publish; to utter (*Knolles*). 32. *To* GIVE *out*. To show in false appearance (*Shakspeare*). 33. *To* GIVE *up*. To resign; to quit; to yield (*Sidney*). 34. *To* GIVE *up*. To abandon (*Stillingfleet*). 35. *To* GIVE *up*. To deliver (*Swift*). 36. *To* GIVE *way*. To yield; not to resist; to make room for (*Collier*).

To GIVE. *v. n.* 1. To rush; to fall on; to give the assault. A French phrase (*Hooker*). 2. To relent; to grow moist; to melt or soften; to thaw (*Bacon*). 3. To move. A French phrase (*Daniel*). 4. *To* GIVE *in*. To go back; to give way: not in use (*Hayward*). 5. *To* GIVE *into*. To adopt; to embrace. A French phrase (*Addison*). 6. *To* GIVE *off*. To cease; to forbear (*Locke*). 7. *To* GIVE *over*. To cease; to act no more. 8. *To* GIVE *out*. To publish; to proclaim (*Swift*). 9. *To* GIVE *out*. To cease; to yield (*Swift*).

GIVE AND TAKE PLATES, in horseracing, plates in running, for which the horses carry weight according to their height, in the proportion of four inches to a hand. The fixed rules for a give and take are, that horses measuring fourteen hands are each to carry nine stone; and that, if above or below which height, they are to carry seven pounds, more or less, for every inch they are higher or lower. A horse, therefore, measuring fourteen hands one inch and a half, will carry nine stone, ten pounds, eight ounces; a horse measuring thirteen hands two inches and a half, will carry only eight stone, three pounds, eight ounces; the former being one inch and a half above the fourteen hands, the other one inch and a half below it.

GI'VER. *s.* (from *to give*.) One that gives; donor; bestower; distributer; granter (*Pope*).

GIVES. *s.* Fetters or shackles for the feet.

GIULA, a town of Upper Hungary, 30 miles S.W. of Great Waradin. Lat. 46. 40 N. Lon. 20. 0 E.

GIUSTANDEL, an episcopal town of Macedonia, in European Turkey. Lat. 41. 40 N. Lon. 20. 36 E.

GIUSTO, in music, a term denoting regularity and equability in time.

GIZZARD. *s.* (*gosier*, French; *gigeria*, Latin.) It is sometimes called *gizzern*.) 1. The strong musculous stomach of a fowl. 2. Apprehension or conception of mind; as, *he frets his gizzard*, he harasses his imagination (*Hudibras*).

GLABRARIA. In botany, a genus of the class polyadelphia, order polyandria. Calyx five-cleft; petals five; nectary placed on the receptacle, and composed of bristles as long as the calyx; stamens thirty, six in each set: drupe. One species only: a large East Indian tree, with leaves alternate, ovate-lanceolate, entire, downy underneath; flowers in axillary clusters.

GLA'BRITY. *s.* (from *glaber*, Latin.) Smoothness; baldness.

GLA'BROUS. (*glabrous*, Latin.) In natural history, smooth; glossy; shining.

GLA'CIAL. *a.* (*glacial*, French; *glacialis*, Latin.) Icy; made of ice; frozen.

To GLA'CIATE. *v. n.* (*glacies*, Lat. *glacer*, French.) To turn into ice.

GLACIA'TION. *s.* (from *glaciate*.) The act of turning into ice; ice formed (*Brown*).

GLA'CIOUS. *a.* (*glacio*, Latin.) Icy; resembling ice (*Brown*).

GLA'CIERS, a name given to some very extensive fields of ice among the Alps. The Glaciers may be divided into two sorts; the first occupying the valleys situated in the bosom of the Alps, which are called Lower Glaciers; the second, which clothe the summits and sides of the mountains, are called Upper Glaciers. 1. The Lower Glaciers are by far the most considerable in extent and depth. Some stretch several leagues in length; that of des Bois, in particular, is more than fifteen miles long, and above three in its greatest breadth. The Lower Glaciers do not, as is generally imagined, communicate with each other, and but few of them are parallel to the central chain: they mostly stretch in a transverse direction, are bordered at the higher extremity by inaccessible rocks, and on the other extend into the cultivated valleys. The thickness of the ice varies in different parts. M. de Saussure found its general depth in the glacier des Bois from eighty to a hundred feet, but questions not the information of those who assert that in some places its thickness exceeds even six hundred feet. These immense fields of ice usually rest on an inclined plain. Being pushed forward by the pressure of their own weight, and but weakly supported by the rugged rocks beneath, they are intersected by large transverse chasms, and present the appearance of walls, pyramids, and other fantastic shapes, observed at all heights and in all situations wherever the declivity exceeds thirty or forty degrees. But in those parts where the plain on which they rest is horizontal, or only gently inclined, the surface of the ice is nearly uniform; the chasms

are but few and narrow, and the traveller crosses on foot without much difficulty. The surface of the ice is not so slippery as that of frozen ponds or rivers; it is rough and granulated, and is only dangerous to the passenger in steep descents. 2. Upper Glaciers may be subdivided into those which cover the summits, and those which extend along the sides of the Alps. Those which cover the summits of the Alps owe their origin to the snow that falls at all seasons of the year, and which remains nearly in its original state, being congealed into a hard substance, and not converted into ice. For although, according to the opinion of some philosophers, the summit of Mont Blanc and of other elevated mountains is, from the glistening of the surface, supposed to be covered with pure ice, yet it appears, both from theory and experience, that it is not ice, but snow. For in so elevated and cold a region there cannot be melted a quantity of snow sufficient to impregnate with water the whole mass which remains undissolved. Experience also justifies this reasoning. M. de Saussure found the top of Mont Blanc only encrusted with ice, which, though of a firm consistence, was yet penetrable with a stick; and on the declivities of the summit he discovered beneath the surface a soft snow without coherence. The substance which clothes the sides of the Alps is neither pure snow like that of the summits, nor ice which forms the Lower Glaciers, but is an assemblage of both.

Considerable difference of opinion has prevailed amongst philosophers, whether the masses of ice and snow in these regions of endless winter increase, decrease, or remain nearly stationary. Mr. Coxe seems inclined to think they vary in their size: that gentleman observes, that the glacier of Montanvert is generally bordered with trees; near the base of this vast body of frozen matter the ice is excavated into an arch, perhaps one hundred feet in height, whence the Arveron rushes with impetuosity and in a large sheet of water. As he approached the ice, he passed through a forest of firs: those near the arch were very ancient, and about eighty feet high; the trees between them and the glacier were evidently younger, from the inferiority of their size and other intrinsic marks, others still less, had been enveloped by the ice, and many were thrown down: arguing from this gradation in the appearance of the firs, he concludes, that the glacier has originally extended to the full grown ancient trees, and dissolving, young ones have grown on its former site, which have been overturned by a fresh increase of ice.

This inference seems almost conclusive, but it is still further supported by the fall of large pieces of granite called moraine by the inhabitants, which, borne along by the ice, sink through it as it dissolves, and falling into the plain, form a border along its extremity; those have been urged forward by the pressure of new ice, and extend even to the place occupied by the large firs.

Exclusive of these circumstances, Mr. Coxe discovered, that the glacier of Grindelwald had diminished, at least, 400 paces, between the dates of his two visits in 1776 and 1785; and in the valley of Chamouny, the Muraille de Glace, which he had described as forming the border of the glacier of Bosson, in 1776, no longer existed in 1785, and young trees had grown on the site of the edge of the glacier of Montanvert.

M. Bourrit, who appears to have viewed and described the glaciers, with all that enthusiasm which the contemplation of such objects is calculated to inspire, speaks of them thus:—"To come at this collected mass of ice (Des Bois) we crossed the Arve, and travelling in a tolerable road, passed some villages or hamlets, whose inhabitants behaved with much politeness; they invited us to go in and rest ourselves, apologized for our reception, and offered us a taste of their honey. After amusing ourselves some time amongst them we resumed our road, and entered a beautiful wood of lofty firs, inhabited by squirrels. The bottom is a fine sand, left there by the inundations of the Arveron; it is a very agreeable walk, and exhibits some extraordinary appearances. In proportion as we advanced into this wood, we observed the objects gradually to vanish from our sight; surprised at this circumstance, we were earnest to discover the cause, and our eyes sought in vain for satisfaction; till, having passed through it, the charm ceased. Judge of our astonishment, when we saw before us an enormous mass of ice twenty times as large as the front of our cathedral of St. Peter, and so constructed, that we have only to change our situation to make it resemble whatever we please. It is a magnificent palace, cased over with the purest crystal; a majestic temple, ornamented with a portico, and columns of several shapes and colours; it has the appearance of a fortress, flanked with towers and bastions to the right and left, and at bottom is a grotto, terminating in a dome of bold construction. This fairy dwelling, this enchanted residence or cave of fancy, is the source of the Arveron, and of the gold which is found in the Arve. And if we add to all this rich variety, the ringing tinkling sound of water dropping from its sides, with the glittering refraction of the solar rays, whilst tints of the most lively green, or blue, or yellow, or violet, have the effect of different compartments, in the several divisions of the grotto, the whole is so theatrically splendid, so completely picturesque, so beyond imagination great and beautiful, that I can hardly believe the art of man has ever yet produced, nor ever will produce, a building so grand in its construction, or so varied in its ornaments. Desirous of surveying every side of this mass, we crossed the river about four hundred yards from its source, and mounting upon the rocks and ice, approached the vault; but while we were attentively employed in viewing all its parts, astonished at the sportiveness of fancy, we cast our eyes at one considerable membe-

of the pile above us, which was unaccountably supported; it seemed to hold by almost nothing: our imprudence was too evident, and we hastened to retreat; yet scarcely had we stepped back thirty paces before it broke off all at once with a prodigious noise, and tumbled, rolling to the very spot where we were standing just before." See AVALANCHES.

GLACIS, in fortification, that mass of earth which serves as a parapet to the covered way, sloping easily towards the champaign, or field. The glacis, otherwise called esplanade, is about six feet high, and loses itself by an insensible diminution in the space of ten fathoms.

GLAD. *a.* (glæd, Saxon; *glad*, Danish.) 1. Cheerful; gay; in a state of hilarity (*Milton*). 2. Wearing a gay appearance; fertile; bright; showy (*Isaiah*). 3. Pleased; elevated with joy (*Proverbs*). 4. Pleasing; exhilarating (*Sidney*). 5. Expressing gladness (*Pope*).

To GLAD. *v. a.* (from the adjective.) To make glad; to cheer; to exhilarate (*Pope*).

GLADBACH, a town of Westphalia, in the duchy of Juliers. Lat. 51. 14 N. Lon. 6. 10 E.

To GLA'DDEN. *v. a.* (from *glad*.) To cheer; to delight; to make glad; to exhilarate (*Addison*).

GLA'DDER. *s.* (from *glad*.) One that makes glad; one that exhilarates (*Dryden*).

GLADE. *s.* (from glopan, Saxon.) A lawn or opening in a wood (*Pope*)

GLA'DEN. GLA'DER. *s.* (from *gladius*, Lat. a sword.) Swordgrass: a general name of plants that rise with a broad blade like sedge.

GLA'DFULNESS *s.* (*glad* and *fulness*.) Joy; gladness: obsolete (*Spenser*).

GLADIATE SILIQUE. Gladiatem legumen. In botany. A gladiate or sword-shaped silique or legume. As in Cleome arabica, Dolichos ensiformis.

GLADIATORS, persons who fought for the amusement of the public in the arenas of amphitheatres in the city of Rome, and at other places under the dominion of the Romans. The term is derived from their use of the gladius, or sword, and the origin of this horrid custom is said to have been the practice of sacrificing captives to the manes of chiefs killed in battle. It seems, however, more probable, that it arose from the funeral games of antiquity, when the friends of the deceased fought in honour of his memory; an instance of which occurs in the twenty-third book of the Iliad, at the burning of the body of Patroclus, Achilles having ordained every solemn rite usual upon those occasions, Homer adds,

> "The prizes next are ordered to the field,
> For the bold champions who the cæstus wield."

The leather which composed the cæstus being loaded with lead, enabled the combatants to give each other mortal blows, though the hands only were used. Epeus, of gigantic stature, challenged the whole of the Grecian chiefs, who were terrified at his bulk, and Euryalus alone accepted his defiance:

> "Him great Tydides urges to contend,
> Warm with the hopes of conquest for his friend;
> Officious with the cincture girds him round,
> And to his wrist the gloves of death are bound."

The captives slain on this occasion were not commanded to fight; they had been led to the pile, and died with the sheep, oxen, coursers, and dogs, that their bodies might be burnt by the flames which consumed that of Patroclus:

> "Then, last of all, and horrible to tell,
> Sad sacrifice! twelve Trojan captives fell."

The above quotations positively prove, that the Romans deviated from their predecessors in the practice of this barbarous custom. The Greeks appear to have destroyed their prisoners on a revengeful principle, and dispatched them immediately; but the former refined upon cruelty, and would rather purchase captives, or destroy the lives of ill-disposed slaves, than send the ashes of their friends to the urn bloodless, or the spectators of the obsequies home, without the gratification of witnessing wretches cutting each other to death, though not under the influence of previous anger. According to Valerius Maximus, and Lampridius in Heliogabalus, gladiators were first introduced at Rome by M. and D. Brutus, at the funeral of their father, in the consulship of Ap. Claudius and M. Fulvius.

There were various kinds of gladiators, distinguished by their weapons, manner, and time of fighting, &c. as, the Andabatæ. The catervarii, who always fought in troops or companies, number against number; or, according to others, who fought promiscuously without any certain order. The dimachæ, who fought armed with two poniards or swords, or with sword and dagger. The essedarii, who fought in cars. The fiscales, or Cæsariana, who belonged to the emperor's company; and who, being more robust and dexterous than the rest, were frequently called for, and therefore named also postulatitii. Several other kinds are mentioned by ancient authors.

There are few nations which have not, in some part of their history, encouraged gladiators in a greater or less degree. It is not a century since we had gladiators in London, who fought and bled, but never killed each other. Malcolm's Anecdotes of the Manners and Customs of this great Metropolis, contains numerous particulars relating to those modern swordsmen, whose exertions were rivalled by several females in the art of boxing and cutting. One of their challenges, from the publication alluded to, will be a proper conclusion to this article: "In Islington Road, on Monday, being the 17th of July, 1727, will be performed a trial of skill by the following combatants: We, Robert Barker and Mary Welsh, from Ireland, having often *contaminated* our swords in the *abdominous*

corporations of such antagonists as have had the insolence to dispute our skill, do find ourselves once more necessitated to challenge, defy, and invite Mr. Stokes, and his bold Amazonian virago, to meet us on the stage; where we hope to give a satisfaction to the honourable lord of our nation, who has laid a wager of twenty guineas on our heads. They that give the most cuts to have the whole money, and the benefit of the house. And if swords, daggers, quarter-staff, fury, rage, and resolution will prevail, our friends shall not meet with a disappointment."—"We, James and Elizabeth Stokes, of the city of London, having already gained an universal approbation by our agility of body, dextrous hands, and courageous hearts, need not *preambulate* on this occasion, but rather choose to exercise the sword to their sorrow, and corroborate the general opinion of the town, than to follow the custom of our repartee antagonists. This will be the last time of Mrs. Stokes performing on the stage. There will be a door on purpose for the reception of the gentlemen, where coaches may drive up to it, and the company come in without being crowded. Attendance will be given at three, and the combatants mount at six. They all fight in the same dresses as before."

GLADIATOR (The dying), is a most valuable monument of ancient sculpture, which is now preserved in the palace of Chighi. This man, when he had received the mortal stroke, is particularly careful ut procumbat honeste, that he might fall honourably. He is seated in a reclining posture on the ground, and has just strength sufficient to support himself on his right arm; and in his expiring moments it is plainly seen that he does not abandon himself to grief and dejection, but is solicitous to maintain that firmness of aspect which the gladiators valued themselves on preserving in this season of distress, and that attitude which they had learnt of the masters of defence. He fears not death, nor seems to betray any tokens of fear by his countenance, nor to shed one tear. We see, in this instance, notwithstanding his remaining strength, that he has but a moment to live; and we view him with attention, that we may see him expire and fall. Thus the ancients knew how to animate marble, and to give it almost every expression of life.

GLADIATORS' WAR, *bellum Gladiatorum* or *Spartacum*, called also the servile war, was a war which the Romans sustained about the year of their city 680. Spartacus, Crinus, and Oenomaus, having escaped, with other gladiators to the number of seventy-four, out of the place where they had been kept at Capua, gathered together a body of slaves, put themselves at their head, rendered themselves masters of all Campania, and gained several victories over the Roman prætors. At length they were defeated in the year 682, at the extremity of Italy, having in vain attempted to pass over into Sicily. This war proved very formidable to the Romans. Crassus was not able to finish it: the great Pompey was forced to be sent as general.

GLADIATORII LUDI, combats originally exhibited on the grave of deceased persons. They were first introduced at Rome by the Bruti upon the death of their father, A. U. C. 488. It was supposed that the ghosts of the dead were rendered propitious by human blood, therefore at funerals it was usual to murder slaves in cool blood. In succeeding ages the barbarity was covered by the specious show of pleasure and voluntary combat; their slaves were permitted to kill each other. Originally captives, criminals, or disobedient slaves, were trained up for combat; but when the diversion became more frequent, and was exhibited on the smallest occasion, to procure esteem and popularity, many of the Roman citizens enlisted themselves among the gladiators, and Nero, at one show, exhibited no less than 400 senators and 600 knights. It is supposed that there were no more than three pair of gladiators exhibited by the Bruti. Their numbers, however, increased with the luxury and power of the city; and under the emperors, not only senators and knights, but even women engaged among the gladiators, and seemed to forget the inferiority of their sex. These cruel sports, after a continuance of 600 years, were abolished by Constantine the Great. They were revived, however, under Constantius, and his two successors. But were finally abolished by Theodoric in the year 500. See Adam's and Kennett's Rom. Antiq. and Lempriere's Class. Dic.

GLADIOLUS. Corn-flag; in botany, a genus of the class triandria, order monogynia. Corol six-parted, tubular, mostly ringent; stamens ascending. Fifty-two species; a few natives of Russia, or the south of Europe; the rest uniformly Cape plants: some of them an undivided, others with a branched scape. We shall instance one or two.

1. G. Communis. Common corn-flag. Corol somewhat ringent; spathe longer than the tube: leaves ensiform, nerved. A native of the south of Europe, with white or red flowers, open, distant, but pointing one way.

2. G. cardinalis. Corol erect, with a companulate border; scape many-flowered, pointing one way; leaves ensiform, many-nerved; a native of the Cape; the segments of the corol scarlet, with a large rhombic white spot on the lower ones; spathe shorter than the tube. A very elegant plant.

3 G. rosalbus. Corol with a funnel form, curved tube, the segments nearly equal; spine two-rowed; leaves linear-ensiform, flat; a little twisted at the base; stamens closely accumbent; flowers pale rosy. See also Nat. Hist. Pl. CXXXIX.

GLADIOLE, in botany. See GLADIOLUS.

GLADIOLE WATER. See BUTOMUS.

GLADIUS, sword. Jus gladii, or right of the sword, is used, in our ancient Latin authors, and in the Norman laws, for supreme jurisdiction.

GLA'DLY. *ad.* (from *glad.*) Joyfully; with gayety; with merriment (*Shakspeare*).

GLA'DNESS. *s.* (from *glad.*) Cheerfulness; joy; exultation (*Dryden*).

GLA'DSOME. *a.* (from *glad.*) 1. Pleased; gay; delighted (*Spenser*). 2. Causing joy; having an appearance of gayety (*Prior*).

GLA'DSOMELY. *ad.* (from *gladsome.*) With gayety and delight.

GLA'DSOMENESS. *s.* (from *gladsome.*) Gayety; showiness; delight.

GLAD'WIN. (Stinking) See IRIS.

GLAI'RE. *s.* (ȝlæꞃ, Saxon, amber; *glar*, Danish, glass; *glaire*, French.) 1. The white of an egg (*Peacham*). 2. A kind of halbert.

To GLAIRE. *v. a.* (*glairer*, Fr. from the noun.) To smear with the white of an egg.

GLAMORGANSHIRE, a county of South Wales, bounded on the north by Brecknockshire, on the east by Monmouthshire, on the south by the Bristol Channel, and on the west by Caermarthenshire; about forty-eight miles from east to west, and twenty-seven from north to south. The greatest part of the sea-coast forms a semi-circular sweep, the western extremity being formed into a narrow beak between the open channel on the one hand, and an arm running round to the Caermarthenshire coast on the other. On the north and north-east sides it is very mountainous, the soil of the hills extremely varied. In some parts they are absolute rocks, in others full of coal and iron. The surface over these mines produces plenty of fine wool. What corn grows in the county is principally between the south side of the mountains and the sea, in a spacious vale, or plain, open to the latter The roads over the mountains are excessively steep, stony, strewed, as well as the heaths on each side of them, with stones of various sizes, detached from the rocks by the winter rains. The air on the north side is sharp, occasioned by the long continuance of the snow on the hills; but on the south side mild and temperate, improved by the sea breezes. Such is the profusion of coal and limestone in this county, that lime is the general manure of it, and there is scarce a cottage that is not white-washed regularly once a week. The plenty of coal, and the conveniency of exportation, have brought a large copper work to Swansea. Glamorganshire contains one episcopal town, Llandaff, and several others, as Cardiff, Caerphilly, Neath, Brigend, Swansey, Llantrisant, Marthyr-Tydvil, and Cowbridge. The principal rivers are the Tave, the Neath, the Taw, the Osmore, and the Rumney. Glamorganshire is divided into 10 hundreds and 118 parishes, which contain 14,762 houses, and 71,525 inhabitants. The whole quantity of surface is about 422,400 acres, of which about 120,000 are uncultivated, including woodlands. The county sends one member to parliament, besides one for the town of Cardiff.

GLAMOUR, or GLAMER, a superstitious term used in Scotland, denoting a kind of mist, believed to be raised by sorcerers; which deluded the spectator with visions of things which did not exist, and changed the appearance of those which did exist.

GLANCE. *s.* (*glantz*, German.) 1. A sudden shoot of light or splendour (*Milton*). 2. A stroke or dart of the beam of sight (*Dr.*) 3. A snatch of sight; a quick view (*Watts*).

To GLANCE. *v. n.* (from the noun.) 1. To shoot a sudden ray of splendour (*Rowe*). 2. To fly off in an oblique direction *Shaksp.*) 3. To strike in an oblique direction (*Pope*). 4. To view with a quick cast of the eye; to play the eye (*Pope*). 5. To censure by oblique hints (*Shakspeare*).

To GLANCE. *v. a.* To move nimbly; to shoot obliquely (*Shakspeare*).

GLA'NCINGLY. *ad.* (from *glance.*) In an oblique broken manner; transiently (*Hakew.*)

GLAND. (*glandula*, a gland). An organic part of the body, composed of blood-vessels, nerves, and absorbents, and destined for the secretion or alteration of some peculiar fluid. The glands of the human body are divided by anatomists into different classes, either according to their structure, or the fluid they contain. According to their fabric they are distinguished into four classes. 1. Simple glands. 2. Compounds of simple glands. 3. Conglobate glands. 4. Conglomerate glands. According to their fluid contents they are more properly divided into, 1. Mucous glands. 2. Sebaceous glands. 3. Lymphatic glands. 4. Salival glands. 5. Lachrymal glands. Simple glands are small hollow follicles, covered with a peculiar membrane, and having a proper excretory duct, through which they evacuate the liquor contained in their cavity. Such are the mucous glands of the nose, tongue, fauces, trachea, stomach, intestines, and urinary bladder, the sebaceous glands about the anus, and those of the ear. These simple glands are either dispersed here and there, or are contiguous to one another, forming a heap in such a manner that they are not covered by a common membrane, but each has its own excretory duct, which is never joined to the excretory duct of another gland. The former are termed solitary simple glands, the latter aggregate or congregate simple glands. The compound glands consist of many simple glands, the excretory ducts of which are joined in one common excretory duct; as the sebaceous glands of the face, lips, palate, and various parts of the skin, especially about the pubes. Conglobate, or, as they are also called, lymphatic glands, are those into which lymphatic vessels enter, and from which they go out again: as the mesenteric, lumbar, &c. They are composed of a texture of lymphatic vessels, connected together by cellular membrane—have no excretory duct—they are largest in the fetus. Conglomerate glands are composed of a congeries of many simple glands, whose excretory ducts open into one common trunk; as the parotid gland, thyroid gland, pancreas, and all the salival glands. Conglomerate glands differ but little from the compound glands, yet they are composed of more simple

glands than the compound. The excretory duct of a gland is the duct through which the fluid of a gland is excreted. The vessels and nerves of glands always come from the neighbouring parts, and the arteries appear to possess a higher degree of irritability. The use of the glands is generally to separate a peculiar liquor, or to change it. The use of the conglobate glands is unknown.

GLANDERS, a disease in the horse, so termed, probably, from the swelling with which it is usually accompanied, of the sub-maxillary glands. It consists of an altered and vitiated action of the vessels which, in a state of health, secrete the mucus covering the pituitary membrane, or that membrane which lines the cavity of the nostrils. In the incipient state of the complaint, this membrane is apt to appear inflamed, and discharges a small proportion of whitish glutinous pus. As the disease becomes more violent, the discharge assumes a sanious appearance, a disagreeable smell, and an unpromising colour, or a mixture of colours, being frequently composed of several, as yellow and green, with red or bloody streaks. At this period, although it may be out of our limits of inspection, there is reason to suspect that ulceration has taken place in some of the sinuses of the head. A small swelling may, in the majority of cases, be perceived in one or more of the glands under the jaws, seldom attended with pain, and scarcely ever increasing to any considerable size. The progress of the disease is extremely uncertain; as some horses will endure it, even for many years, without any other obvious inconvenience than a slight discharge, and the enlargement of the glands; and, indeed, there have been instances of these symptoms disappearing for several weeks, and returning, perhaps, with no augmented virulence. In most cases, however, the course of the malady is more rapid; the bones and cartilages of the nose are speedily eroded by the malignity of the ulcers, from which an absorption commences, and conveys the poison into the circulation, gradually and fatally contaminating the whole animal frame.

It is but seldom that either the appetite or condition of a glandered horse suffers materially in the early or mild stage of the complaint. When, however, it has spread its dominion over the thoracic viscera, forming ulcers in the substance of the lungs and in the wind-pipe, great pain and difficulty are experienced in respiration, the discharge becomes immense, the appetite is injured, the body of the unfortunate animal displays a haggard and striking picture of distress, and, if neither motives of humanity nor of safety induce his owner to destroy him, dissolution will approach by tardy steps, and, at length, afford effectual relief to the wretched sufferer.

It seems pretty universally understood, that the disease called glanders is highly contagious, the matter of it for years retaining its noxious quality. We believe, however, that contagion is not so frequently the cause of glanders as some other circumstances. The horses of regiments that have been long encamped, in severe weather, suffer considerably more from the glanders than those which have not been engaged in that species of service. It would appear, that this arises from horses, on such occasions, being confined to a particular spot, when not on duty, and exposed to all the inclemencies of the season; and, in the mean while, they are prevented from supporting the bodily warmth by such means as they would instinctively employ at grass, such as ranging about, and seizing every opportunity of sheltering themselves against the keenness of the weather. Sudden changes of temperature, and also of condition, may be considered as great causes of glanders: it is well known, that horses of the above description have to undergo these disadvantages most particularly. To the causes already mentioned may be added, infection from the matter of farcy when applied to the nostrils, violent colds long neglected, and the respiration of foul air in close stables, or in the holds of shipping. It was the opinion of the celebrated Buffon, that the horse acquired the glanders by immersing his nostrils deeply into the water when drinking, and the coldness of the fluid producing an inflammation of the pituitary membrane. To support this conjecture, he remarked, that the ass drank more superficially, or from the surface of the water, by which method he avoided the complaint. Were the ass, however, treated after the manner of horses, we are convinced that the one would be as liable as the other to the glanders; but, inured from his infancy by nature and habit, his weather-beaten frame is nowise affected by a variety of changes which operate so frequently and so powerfully on the animal more delicately used. Notwithstanding these circumstances, the ass is subject to the glanders; and, according to the present state of our knowledge of the disease, it seems peculiar to the horse, the ass, and the mule.

The efforts of veterinarians have usually been employed in endeavours to destroy, not to propagate, this dreadful malady, and we are acquainted with no other quadrupeds liable to be afflicted with it; yet we are strongly inclined to suppose it might be communicated to some of them by inoculation. It appears that a glandered horse may accompany horned cattle, when at grass, without any danger of their receiving injury from the disease. We should be happy could we offer to the public an effectual method of cure for this baneful distemper, but this, at present is not within the limits of our abilities: still, we must confess, we are sanguine enough to hope, that, by some accident or other, or by the exertions and experiments of men of enterprising genius, an antidote will be happily discovered, fully adequate to the important task of totally eradicating this most destructive and very prevalent calamity.

On a supposition that the glanders was merely a local disease, some writers, particularly of the old school, have asserted, that it might be removed by the use of astringent and detergent injections. More effectually to apply these, the sinuses of the head have been laid open by the operation of trepanning; yet, notwithstanding the assertions of the advocates of this treatment, we believe this practice has never been attended with permanent success. We imagine, that cases of glanders truly local are seldom to be met with. The blood is generally much contaminated, as may be easily proved by the operation of transfusion: if we take a quantity of blood from a healthy horse or ass, and replace it with an equal proportion, while in its fluid state, of blood drawn from the animal afflicted with the glanders, the disease will make its appearance in the course of a few days, and in a more violent degree than

it can be produced by any other means of contagion. For a particular description of this experiment, see the article TRANSFUSION.

The analogy existing between the glanders and the venereal disease is exceedingly striking: unluckily, however, they vary in the most essential particular; for the glanders will not yield to mercury. A case indeed occurred at the Veterinary College, of a coach-horse, belonging to Mr. Houlston, one of the examining committee of that institution, supposed to have been perfectly cured by a long course of mercurials. Professor Coleman makes mention of this case in his Lectures, and certainly with good reason, as two facts were apparently established, which seemed to mark it with a degree of decision: these are, first, that the horse was perfectly cured; and, secondly, that the disease of which he was so recovered was the glanders. No doubt would have arisen as to the nature of his disease, had it not yielded to the treatment employed, which was that of repeated and long-continued doses of calomel, carried to the extent of salivation. To remove that doubt, however, the horse was kept in a stable with other glandered horses; so that if the disease had been any other than what was supposed, the animal could not fail of being infected; but the fact was, that he was sent from the infirmary of the College free from the complaint, and we have since had reason to know that he experienced no relapse. It may be supposed, that this case led to many trials of a similar nature, but, unhappily, without the success which was hoped for by the Professor, who exerted his wonted ingenuity to improve the hint which this solitary instance appeared to afford. We too have administered mercury in every way we thought the most promising of success; but, though we have sometimes flattered ourselves that the symptoms were abated by its assistance for a time, we have invariably suffered an ultimate disappointment.

Some years ago, great expectations were formed from the use of the mineral acids in the venereal disease, and, from the obvious resemblance that that complaint and the glanders bear towards each other, some trials were made on a few cases of the latter, but without the desired success.

We have been informed, and from respectable authority, of horses decidedly glandered recovering spontaneously; but our own experience does not supply a single fact to countenance this suggestion. As the glanders are equally fatal and contagious, great attention ought to be paid to any discharge which may be perceived from the nostrils, or any swelling of the glands; for one of these circumstances does not invariably precede the other. Colds and strangles may be mistaken, by persons unacquainted with the nature of the diseases of horses, for the glanders; but a considerable light will be thrown on the subject, perhaps, by the following observations. In the former complaints there is always some degree of fever, a dulness about the eyes, and a loss of appetite: in glanders, none of these symptoms occur, except in its latest stages. In colds, and in the strangles, the swollen glands are painful to the touch, increase rapidly in bulk, and may be brought without much difficulty to suppuration: in glanders, they are nearly insensible, and seldom become larger than a walnut. The discharge from a catarrh is usually from both nostrils, is plentiful in quantity, of a healthy colour and consistence, and inoffensive odour; it will flow still more profusely by exposing the head to the steams of hot mashes: on the other hand, the discharge in consequence of glanders is originally very small in quantity, soon acquiring a strong and disagreeable smell and colour, and is very little affected by warm vapours. A cold does not always, though it does in general, attack both nostrils: the glanders most frequently affects one only, to which it may confine itself for many months, and the gland will most probably be found enlarged on the side of the affected nostril. In all cases, however, where there appears the most distant prospect of danger, it will be highly prudent to separate the diseased from other horses; and, before the expiration of any long period, we shall be pretty accurately convinced of the real disposition of the complaint.

As we are led, by experience and the information of others, to think, that severe or tedious catarrh, attended with a discharge from the nose, is sometimes apt to degenerate into glanders, we conceive that, on such an occasion, the means recommended for the cure of the former (see the article CATARRH) should be particularly attended to, as they may possibly have the effect of preventing an evil of a more serious complexion. Wherever the matter may be supposed to be detained or lodged in the upper parts of the nostrils, the steams of scalded bran, and injections of milk-warm water, frequently employed, will be found of considerable advantage.

When a horse exhibits such appearances as hold out an undoubted proof of the disease being the glanders, the sooner he is destroyed the safer it will be to the proprietor, as well as more humane to the animal. Nothing but laudable motives of experiment should induce us to protract his tedious and melancholy existence.

We have observed, that, whenever a horse is in the least suspected of glanders, it is proper that he should be removed from other horses, and kept alone, sufficiently secure from all possible communication with them: but particular care is also to be taken that the rack, manger, and such other parts of the stable as he may have come in contact with, be thoroughly cleansed from every particle of the infectious matter, the virulence of which we know no means of destroying but by totally removing the matter itself. The most effectual way of accomplishing the above purpose will be by scraping the contaminated parts with knives, or other sharp instruments, scouring them afterwards with soap, sand, and boiling water, and repeating the process till we are convinced it has exterminated every source of contagion; and lastly, a thick coat of well-sized lime should be spread over the whole. It is scarcely necessary to add, that the litter must be swept completely away, and the stable-floor properly cleaned.

It is a common practice with the owners of horses, when they have had any one of them seized with the glanders, to bleed and purge the rest by way of prevention: the intention is certainly good, but the consequences cannot possibly prove what they are led to expect. The above method will serve rather to promote, than prevent, the disease, as it will considerably increase the action of the absorbent vessels, by which action the glanders is conveyed into the system. All we would recommend on these occasions is, to remove them from that part of the stable in which

the suspected horse has been standing, until it shall have been made pure from all matters of an infectious quality, and their nostrils may be washed a few times with a sponge and warm water.

Great stress having been laid by writers on farriery on the virtue of fumigations of brimstone and other substances, some persons, fully depending on their efficacy, have adopted them, without attending to such simple, yet much more powerful, means as we have already mentioned. It is from actual contact only with the matter of a glandered horse, and not from any vapour that arises from him, that other horses receive the infection; and although we admit that foul air will produce the glanders, the air we mean is what has become heated and vitiated by being respired by a number of animals for too long a period. We believe, that, by throwing open the doors and windows of the stable for several days, every purpose of fumigation will be answered; but where the mind can receive any satisfaction from their use, it will certainly be as well to employ them, at the same time attending to the other precautions.

Mr. St. Bel observes, he restored many horses that were "thought," by some, "to be glandered," because they had no "certain criterion for ascertaining the true glanders;" but he candidly confesses, that he never succeeded "but in one instance," in effecting a complete cure of that disease. That instance, however, which might have been more valuable than all these instances of failure, he has not thought proper to detail. Nevertheless, if we are to give him credit for this assertion, in spite of his having withheld the particulars of so inestimable a fact, it will at least serve to strengthen the idea, that the glanders is not an incurable disease in all possible instances.

Mr. St. Bel, in a situation so favourable to trials of that nature, was induced to ascertain the effect of inoculation of the virus of glanders into the bodies of sound animals, as well as the production of the disease by contact.

1. "Two sound horses, the one fresh from grass, aged six years, and the other nine years, just come from work, were placed by a horse who had the glanders, drinking out of the same pail, and eating at the same manger. The first shewed evident signs of the glanders at the expiration of thirty-four days. It fully declared itself in the second at the end of six weeks."

2. "Two horses in good health, the one seven, the other eleven, years old, both just taken from work, were placed by a horse who had the glanders. The former caught the disease, and ran at the nostrils, fifty-two days afterwards, the second in three months."

3. "A horse, thirteen years old, very lean, was made to drink the same water out of the same pail with a horse who had the glanders, and continued so do for two months; but he was kept from the diseased animal during that time. He did not catch the glanders."

4. "A horse, nine years old, in tolerable condition, placed by a horse who had the glanders in the last stage of the disorder, caught it at the end of forty-three days."

5. "Three old horses, destined to the anatomical investigations of the school, having been inoculated with the virus in the neck, did not catch the disease. This experiment was repeated on various horses of all ages, without producing any effect. It was also performed upon an ox a sheep, and a dog, without impairing in the least the health of those animals."

6. "The coverings and saddles that had been used to glandered horses, being placed on several horses in good health for a month, and during the heat of summer, did not convey the distemper."

7. "The virus, mixed with a little flour, given to three horses for the space of a week, communicated the disease to the youngest at the end of a month. The two others did not sicken till some time after."

Mr. St. Bel observes, that, only by multiplying such experiments, we shall be able, 1st, To ascertain the degree of infection of the glanders. 2dly, To discover the first symptoms by which it is announced, and which have escaped our notice to this day. 3dly, We should, by such means, be certain of attacking it in its origin, and might attain to a probable method of cure: "for, notwithstanding my failures," says this writer, "I think that a remedy may be found for the glanders. The animal, vegetable, and mineral kingdoms abound with an infinite number of substances, the combination and rational application of which will, perhaps, in time, overcome those obstacles which have hitherto opposed the progress of the veterinary art, in this and many other diseases. Discoveries wait only favourable opportunities to disclose themselves; and the most favourable are those which are furnished by scientific associations extending their patronage and encouragement for the perfection of the arts."

In concluding the account of his experiments, he observes, that many circumstances have convinced him, that the virus of the glanders has more activity in southern than in northern countries; and that its progress is more rapid in the mule and the ass, than in the horse; but that the former are not so subject to receive it by infection or contact as the horse is.

Copper, as an internal medicine, has been used progressively to an extent of not more, at best, than from a dram to an ounce of verdigris only; but with even less effect than mercury

GLANDI'FEROUS. *a.* (*glans* and *fero*, Latin.) Bearing mast; bearing acorns (*Mortimer*).

GLANDULA LACHRYMALIS. See LACHRYMAL GLAND.

GLANDULÆ MYRTIFORMES. *Carunculæ myrtiformes.* The small glandiform bodies at the entrance of the vagina in women. They are the remains of the hymen, which is cleft in several parts during the first coition.

GLANDULÆ PACCHIONIÆ. (*Pacchioni*, the name of the discoverer.) A number of small, oval, fatty substances, not yet fully ascertained to be glandular, situated under the dura mater, about the sides of the longitudinal sinus. Their use is not known.

GLANDULATION. In botany. The situation and structure of glands.

GLANDULE. In botany. A little gland. Papilla humorem excernens. Or, as it is explained in Regn. Veg.—fulcrum secernens liquorem. An excretory or secretory duct or vessel. Exemplified in urena, ricinus, iatropha, passiflora, cassia, opulus, turnera, salix

tetrandra, heliocarpus, brionia zeylanica, acacia cornigera, bauhinia aculeata, prunus armeniaca, amygdalus, morisona.

Glands or glandules are usually found on the leaves, the petioles, the peduncles, or the stipules.

GLA'NDULE. *s.* (*glandula*, Lat.) A small gland serving to the secretion of humours (*Ray*).

GLANDULO'SITY. *s.* (from *glandulous.*) A collection of glands (*Brown*).

GLA'NDULOUS. *a.* (*glandulosus*, Latin.) Pertaining to the glands; subsisting in the glands; having the nature of glands (*Brown*).

GLANDULOUS LEAF, or GLANDULAR LEAF, in botany. A leaf which has glands either on the surface or on the serratures.

GLANFORD BRIDGE. See BRIGG.

GLANS PENIS, in anatomy. (*Glans.*) The very vascular body that forms the apex of the penis. The posterior circle is termed the corona glandis. See CORPUS SPONGIOSUM URETHRÆ.

GLANS UNGUENTARIA. See BEN NUX.

GLANVIL (Joseph), a learned and ingenious, but fanciful and credulous writer in the 17th century, was born at Plymouth in 1636, and bred at Oxford. He became a great admirer of Mr. Baxter, and a zealous person for a commonwealth. After the restoration, he published The Vanity of Dogmatizing; was chosen a fellow of the Royal Society; and, taking orders in 1662, was presented to the vicarage of Frome-Selwood in Somersetshire. This same year he published his Lux Orientalis; in 1665 his Scepsis Scientifica; and in the year following, Some Philosophical Considerations touching the Being of Witches and Witchcraft, and other pieces on the same subject. In 1660 he published Plus Ultra; or, The Progress and Advancement of Knowledge since the Days of Aristotle. He likewise published A seasonable Recommendation and Defence of Reason; and Philosophia Pia, or A Discourse of the religious Temper and Tendencies of the Experimental Philosophy. In 1678 he was made a prebendary of Worcester, and died in 1680.

GLARE, in oryctology. See ARENA.

To GLARE. *v. n.* (*glaeren*, Dutch.) 1. To shine so as to dazzle the eyes (*Fairfax*). 2. To look with fierce piercing eyes (*Shakspeare*). 3. To shine ostentatiously (*Felton*).

To GLARE. *v. a.* To shoot such splendour as the eyes cannot bear (*Milton*).

GLARE. *s.* (from the verb.) 1. Overpowering lustre; splendour, such as dazzles the eyes (*Pope*). 2. A fierce piercing look (*Milton*).

GLAREOLA. Pratincole. In zoology, a genus of the class aves, order grallæ. Bill strong, stout, straight, hooked at the tip; nostrils at the base of the bill linear, oblique; gape of the mouth large; feet four-toed; toes long, slender, connected at the base by a membrane; tail forked, consisting of twelve feathers. Three species, as follow:

1. G. austriaca. Austrian pratincole. Above grey-brown; collar black; chin and throat white; breast and belly reddish-grey. Four other varieties from varieties of hues. Three varieties inhabit the heaths of Europe, near the banks of rivers; two varieties are found on the coast of Coromandel. About nine inches long; feeds on worms and aquatic insects; is very restless and clamorous.

2. G. senegalensis. Senegal pratincole. Bill, legs, and whole body, brown. Inhabits near the Senegal; and also Siberia: nine and a half inches long.

3. G. navia. Spotted pratincole. Brown spotted with white; lower parts of the belly and vent reddish-white, with black spots; bill and legs black. Inhabits Germany: size of G. austriaca.

GLA'REOUS. *a.* (*glarieux*, French, *glareosus*, Latin; from *glaire.*) Consisting of viscous transparent matter, like the white of an egg.

GLA'RING. *a.* Applied to any thing notorious; as, a *glaring* crime.

GLARUS, one of the thirteen cantons in Swisserland, bounded on the E. by the Grisons; on the S. by the same, the canton of Uri, and that of Schweitz; and on the N. by the river Linth. It is a mountainous country; and their chief trade is in cattle, cheese, and butter. The government is democratic: every person of the age of sixteen has a vote in the Landsgemeind, or General Assembly, which is held annually in an open plain. This assembly ratifies new laws, lays contributions, enters into alliances, declares war, and makes peace. The Landamman is the chief of the republic, and is alternately chosen from among the protestants and catholics; with this difference, that the former remains three years in office, the latter only two. Both sects live together in the greatest harmony: in several parts, they successively perform divine service in the same church; and all the offices of state are amicably administered by both. The executive power is in a council of regency, composed of 48 protestants and 15 catholics; each sect has its particular court of justice; and it is necessary, in all lawsuits between persons of different religions, that the person having the casting voice among the five or nine judges, who are to determine the cause, should be of the same religion as the defendant. Glarus is surrounded by the Alps except towards the north, where is the only entrance. The capital of this canton is of the same name, and is situated in lat. 46. 56 N. Lon. 9. 1 E.

GLASGOW, a city of Scotland, in the county of Lanerk, situated on the banks of the Clyde, which, by an act of parliament, and at a considerable expence, has been within these last thirty years made navigable for vessels drawing seven feet six inches of water. It was formerly the see of a bishop, said to have been founded in the sixth century, and erected into at archbishopric in the 15th. The cathedral escaped the ill-directed zeal of the reformers, and still remains at least a venerable monument of Gothic architecture, preserved by the care of the inhabitants. In the year 1172,

Glasgow was erected into a royal borough. In the year 1611, the city received a charter from James VI., and, in 1636, another from king Charles I., with considerable power and privileges, which charters were confirmed by acts of parliament in 1661 and 1690. The principal trade of Glasgow formerly was the curing and exporting of salmon and herrings, the principal market for which was France, from whence they imported wines, brandy, and salt. On the union with England, in the year 1707, the merchants of Glasgow first entered into the American trade. And, in the year 1775, they imported upwards of 57,000 hogsheads of tobacco, 5000 of sugar, upwards of 110 puncheons of rum, and 500 bags of cotton. Since the decline of the American trade, the merchants have found out new channels, and the trade is still increasing. Varieties of manufactures are carried on at Glasgow, the principal of which seem to be in the article of cotton, pottery, coarse earthen ware, hats, stockings, gloves, ropes, cordage, glass, and several others. The number of inhabited houses in Glasgow is upwards of 12,000, and 86,380 inhabitants. Glasgow was originally one parish, but now, for the benefit of the poor and ease of ministers, divided into eight, with as many churches, besides three chapels of ease. Glasgow contains several hospitals and charitable foundations, and a public infirmary. The university of Glasgow was founded in the year 1454, under the direction of a chancellor, rector, dean, principal, and fourteen professors. Distance 45 miles from Edinburgh. Lat. 55. 42 N. Lon. 4. 2 W.

GLASGOW (Port), a town in Renfrewshire, on the S. side of the Clyde, erected in 1710, to serve as the seaport of the city of Glasgow, from which it is distant about 21 miles.

GLASS, *vitrum*, a transparent, solid, brittle, factitious body, produced by a mixture of earthy or metallic, with saline substances fused together by the action of fire.

The word is formed of the Latin *glastum*, a plant called, by the Greeks, *isatis*; by the Romans, *vitrum*; by the ancient Britons, *guadum*; by the English, *woad*. We find frequent mention of this plant in ancient writers, particularly Cæsar, Vitruvius, Pliny, &c. who relate, that the ancient Britons painted or dyed their bodies with glastum, guadum, vitrum, &c. i. e. with the blue colour procured from this plant. And hence the factitious matter, we are speaking of, came to be called glass, as having always somewhat of this bluishness in it.

At what time the art of glass-making was first invented is altogether uncertain. Some imagine it to have been invented before the flood: but of this we have no direct proof, though there is no improbability in the supposition; for we know, that it is almost impossible to excite a very violent fire, such as is necessary in metallurgic operations, without vitrifying part of the bricks or stones wherewith the furnace is built. This, indeed, might furnish the first hints of glass-making; though it is also very probable, that such imperfect vitrifications would be observed a long time before people thought of making any use of them.

The Egyptians boast, that this art was taught them by their great Hermes.' Aristophanes, Aristotle, Alexander, Aphrodiseus, Lucretius, and St. John the divine, put it out of all doubt that glass was used in their days. Pliny relates, that it was first discovered accidentally in Syria, at the mouth of the river Belus, by certain merchants driven thither by a storm at sea; who being obliged to continue there, and dress their victuals by making a fire on the ground, where there was great plenty of the herb kali; that plant, burning to ashes, its salts mixed and incorporated with the sand, or stones fit for vitrification, and thus produced glass; and that, this accident being known, the people of Sidon in that neighbourhood essayed the work, and brought glass into use; since which time the art has been continually improving. Be this as it may, however, the first glass-houses mentioned in history were erected in the city of Tyre, and here was the only staple of the manufacture for many ages. The sand which lay on the shore for about half a mile round the mouth of the river Belus was peculiarly adapted to the making of glass, as being neat and glittering; and the wide range of the Tyrian commerce gave an ample vent for the productions of the furnace.

Mr. Nixon, in his observations on a plate of glass found at Herculaneum, which was destroyed A.D. 80, on which occasion Pliny lost his life, offers several probable conjectures as to the uses to which such plates might be applied. Such plates, he supposes, might serve for specula, or looking-glasses; for Pliny, in speaking of Sidon, adds, siquidem etiam specula excogitaverat: the reflection of images from these ancient specula being effected by besmearing them behind, or tinging them through with some dark colour. Another use in which they might be employed was for adorning the walls of their apartments, by way of wainscot, to which Pliny is supposed to refer by his vitreæ cameræ, lib. xxxvi. cap. 25. § 64. Mr. Nixon farther conjectures, that these glass plates might be used for windows, as well as the lamina of lapis specularis and phengites, which were improvements in luxury mentioned by Seneca, and introduced in his time, Ep. xc. However, there is no positive authority relating to the using of glass-windows earlier than the close of the third century: Manifestius est (says Lactantius), mentem esse, quæ per oculos ea quæ sunt opposita, transpiciat, quasi per fenestras lucente vitro aut speculari lapide obductas.

The first time we hear of glass made among the Romans was in the reign of Tiberius, when Pliny relates that an artist had his house demolished for making glass malleable, or rather flexible; though Petronius Arbiter and some others assure us, that the emperor ordered the artist to be beheaded for his invention.

It appears, however, that before the conquest of Britain by the Romans, glass-houses had been erected in this island, as well as in Gaul, Spain, and Italy. Hence in many parts of the country are to be found annulets of glass, having a narrow perforation and thick rim, denominated by the remaining Britons gleineu naigreedh, or glass adders, and which were probably in former times used as annulets by the druids. It can scarcely be questioned that the Britons were sufficiently well versed in the manufacture of glass, to form out of it many more useful instruments than the glass beads. History indeed assures us, that they did manufacture a considerable quantity of glass vessels. These, like their annulets, were most

probably green, blue, yellow, or black, and many of them curiously streaked with other colours. The process in the manufacture would be nearly the same with that of the Gauls and Spaniards. The sand of their shores, being reduced to a sufficient degree of fineness by art, was mixed with three-fourths of its weight of their nitre (much the same with our kelp), and both were melted together. The metal was then poured into other vessels, where it was left to harden into a mass, and afterwards replaced in the furnace, where it became transparent in the boiling, and was afterwards figured by blowing or modelling in the lathe into such vessels as they wanted.

It is not probable that the arrival of the Romans would improve the glass manufacture among the Britons. The taste of the Romans at that time was just the reverse of that of the inhabitants of this island. The former preferred silver and gold to glass for the composition of their drinking-vessels. They made, indeed, great improvements in their own at Rome, during the government of Nero. The vessels then formed of this metal rivalled the bowls of porcelain in their dearness, and equalled the cups of crystal in their transparency. But these were by far too costly for common use; and therefore, in all probability, were never attempted in Britain. The glass commonly made use of by the Romans was of a quality greatly inferior; and, from the fragments which have been discovered at the stations or towns of either, appear to have consisted of a thick, sometimes white, but mostly blue green, metal.

According to the venerable Bede, artificers skilled in making glass for windows were brought over into England in the year 674 by abbot Benedict, who were employed in glazing the church and monastery of Weremouth. According to others, they were first brought over by Wilfrid, bishop of Worcester, about the same time. Till this time the art of making such glass was unknown in Britain; though glass windows did not begin to be common before the year 1180: till this period they were very scarce in private houses, and considered as a kind of luxury, and as marks of great magnificence. Italy had them first, next France, from whence they came into England.

Venice for many years excelled all Europe in the fineness of its glasses; and in the thirteenth century the Venetians were the only people that had the secret of making crystal looking-glasses. The great glass-works were at Muran, or Murano, a village near the city, which furnished all Europe with the finest and largest glasses.

The glass manufacture was first begun in England in 1557: the finer sort was made in the place called Crutched Friars, in London; the fine flint glass, little inferior to that of Venice, was first made in the Savoy-house, in the Strand, London. This manufacture appears to have been much improved in 1635, when it was carried on with sea-coal or pit-coal instead of wood, and a monopoly was granted to sir Robert Mansell, who was allowed to import the fine Venetian flint glasses for drinking, the art of making which was not brought to perfection before the reign of William III. But the first glass plates, for looking-glasses and coach-windows, were made in 1673, at Lambeth, by the encouragement of the duke of Buckingham; who in 1670 introduced the manufacture of fine glass into England, by means of Venetian artists, with amazing success. So that within a century past, the French and English have not only come up to, but even surpassed, the Venetians; and we are now no longer supplied from abroad.

The French made a considerable improvement in the art of glass, by the invention of a method of casting very large plates, till then unknown, and scarce practised yet by any but themselves and the English. That court applied itself with a laudable industry to cultivate and improve the glass manufacture. A company of glass-men was established by letters patent; and it was provided by an arret, not only that the working in glass should not derogate any thing from nobility, but even that none but nobles should be allowed to work in it.

An extensive manufactory of this elegant and valuable branch of commerce was first established in Lancashire, about the year 1773, through the spirited exertions of a very respectable body of proprietors, who were incorporated by an act of parliament. From those various difficulties constantly attendant upon new undertakings, when they have to contend with powerful foreign establishments, it has not, however, been conducted with any great degree of success.

The properties of glass are very remarkable, some of which follow.

1. It is one of the most elastic bodies in nature. If the force with which glass balls strike each other be reckoned 16, that wherewith they recede by virtue of their elasticity will be nearly 15.

2. When glass is suddenly cooled, it becomes exceedingly brittle; and this brittleness is sometimes attended with very surprising phænomena. Hollow bells made of annealed glass, with a small hole in them, will fly to pieces by the heat of the hand only, if the hole by which the internal and external air communicate be stopped with a finger. Lately, however, some vessels made of such annealed glass have been discovered, which have the remarkable property of resisting very hard strokes given from without, though they shiver to pieces by the shocks received from the fall of very light and minute bodies dropped into their cavities. These glasses may be made of any shape; all that need be observed in making them is, that their bottom be thicker than their sides. The thicker the bottom is, the easier do the glasses break. One whose bottom is three fingers breadth in thickness flies with as much ease at least as the thinnest glass. Some of these vessels have been tried with strokes of a mallet sufficient to drive a nail into wood tolerably hard, and have held good without breaking. They have also resisted the shock of several heavy bodies let fall into their cavities, from the height of two or three feet; as musket-balls, pieces of iron or other metal, pyrites, jasper, wood, bone, &c. But this is not surprising, as other glasses of the same shape and size will do the same: but the wonder is, that taking a shiver of flint of the size of a small pea, and letting it fall into the glass only from the height of three inches, in about two seconds the glass flies, and sometimes at the very moment of the shock; nay, a bit of flint no larger than a grain dropped into several glasses successively, though it did not immediately break them, yet when set by, they all flew in less than three quarters of an hour. Some other bodies produce this effect as well as flint; as sapphire, diamond, porcelain, hard-tempered steel; also marbles such as boys play with, and likewise pearls. These experiments were made before the Royal Society, and succeeded equally when the glasses were held in the hand, when they were rested on a pillow, put in water,

are filled with water. It is also remarkable, that the glasses broke upon having their bottoms slightly rubbed with the finger, though some of them did not fly till half an hour after the rubbing. If the glasses are every where extremely thin, they do not break in these circumstances.

Some have pretended to account for these phænomena, by saying, that the bodies dropped into the vessels cause a concussion which is stronger than the cohesive force of the glass, and consequently that a rupture must ensue. But why does not a ball of iron, gold, silver, or copper, which are perhaps a thousand times heavier than flint, produce the same effect? It is because they are not elastic. But surely iron is more elastic than the end of one's finger. Mr. Euler has endeavoured to account for these appearances from his principles of percussion. He thinks that this experiment entirely overthrows the opinion of those who measure the force of percussion by the vis viva, or absolute apparent strength of the stroke. According to his principles, the great hardness and angular figure of the flint, which makes the space of contact with the glass extremely small, ought to cause an impression on the glass vastly greater than lead, or any other metal; and this may account for the flint's breaking the vessel, though the bullet, even falling from a considerable height, does no damage. Hollow cups made of green bottle-glass, some of them three inches thick at the bottom, were instantly broken by a shiver of flint, weighing about two grains, though they had resisted the shock of a musket-ball from the height of three feet.

That Mr. Euler's theory cannot be conclusive any more than the other, must appear evident from a very slight consideration. It is not by angular bodies alone that the glasses are broken. The marbles with which children play are round, and yet they have the same effect with the angular flint. Besides, if it was the mere force of percussion which broke the glasses, undoubtedly the fracture would always take place at the very instant of the stroke; but we have seen, that this did not happen sometimes till a very considerable space of time had elapsed. It is evident, therefore, that this effect is occasioned by the putting in motion some subtile fluid with which the substance of the glass is filled, and that the motions of this fluid, when once excited in a particular part of the glass, soon propagate themselves through the whole or greatest part of it, by which means the cohesive power becomes at last too weak to resist them. There can be little doubt that the fluid just now mentioned is that of electricity. It is known to exist in glass in very great quantity; and it also is known to be capable of breaking glasses, even when annealed with the greatest care, if put into too violent a motion. Probably the cooling of glass hastily may make it more electric than is consistent with its cohesive power, so that it is broken by the least increase of motion in the electric fluid by friction or otherwise. This is evidently the case when it is broken by rubbing with the finger; but why it should also break by the mere contact of flint and the other bodies above mentioned, has not yet been satisfactorily accounted for.

A most remarkable phænomenon also is produced in glass tubes placed in certain circumstances. When these are laid before a fire in an horizontal position, having their extremities properly supported, they acquire a rotatory motion round their axis, and also a progressive motion towards the fire, even when their supports are declining from the fire, so that the tubes will move a little way up hill towards the fire. When the tubes are placed in a nearly upright posture, leaning to the right hand, the motion will be from east to west; but if they lean to the left hand, their motion will be from west to east; and the nearer they are placed to the perfectly upright posture, the less will the motion be either way. If the tube is placed horizontally on a glass plane, the fragment, for instance, of coach window-glass, instead of moving towards the fire, it will move from it, and about its axis in a contrary direction to what it had done before; nay, it will recede from the fire, and move a little up hill when the plane inclines towards the fire. These experiments are recorded in the Philosophical Transactions. They succeeded best with tubes about 20 or 22 inches long, which had in each end a pretty strong pin fixed in cork for an axis.

The reason given for these phænomena is the swelling of the tubes towards the fire by the heat, which is known to expand all bodies. For, say the adopters of this hypothesis, granting the existence of such a swelling, gravity must pull the tube down when supported near its extremities; and a fresh part being exposed to the fire, it must also swell out and fall down, and so on. But, without going farther in the explanation of this hypothesis, it may be here remarked, that the fundamental principle on which it proceeds is false: for though fire indeed makes bodies expand, it does not increase them in weight; and therefore the sides of the tube, though one of them is expanded by the fire, must still remain in equilibrio; and hence we must conclude, that the cause of these phænomena remain yet to be discovered.

4. Glass is less dilatable by heat than metalline substances, and solid glass sticks are less dilatable than tubes. This was first discovered by Col. Roy (see Phil. Trans. vol. lxvii. p. 665), in making experiments in order to reduce barometers to a greater degree of exactness than hath hitherto been found practicable; and since his experiments were made, one of the tubes 18 inches long, being compared with a solid glass rod of the same length, the former was found by a pyrometer to expand four times as much as the other, in a heat approaching to that of boiling oil. On account of the general quality which glass has of expanding less than metal, M. de Luc recommends it to be used in pendulums: and he says it has also this good quality, that its expansions are always equable and proportioned to the degrees of heat; a quality which is not to be found in any other substance yet known.

5. Glass appears to be more fit for the condensation of vapours than metallic substances. An open glass filled with water, in the summer time, will gather drops of water on the outside, just as far as the water in the inside reaches; and a person's breath blown on it manifestly moistens it. Glass also becomes moist with dew, when metals do not.

6. A drinking-glass partly filled with water, and rubbed on the brim with a wet finger, yields musical notes, higher or lower as the glass is more or less full, and will make the liquor frisk and leap about. See ARMONICA.

7. Glass is possessed of extraordinary electrical virtues. See ELECTRICITY, passim.

GLASS (Manufacture of). Glass is made from

sand, flints, spar, or some other silicious matters. White sand is the substance in the most repute at present, as it requires no preparation for coarse goods; and for the finest washing in fair water is sufficient: whereas flints require a tedious process of calcination, and after that to be pulverized. Many other substances may be used for experiment; though sand only is employed in the manufactory.

It is also necessary that the silicious matter should be fused in contact with something called a flux. The substances proper for this purpose are lead, borax, arsenic, nitre, or any alkaline matter. The lead is used in the state of red lead, and the alkalies are soda, pearl ashes, sea salt, and wood ashes. When red lead is used alone, it gives the glass a yellow cast, and requires the addition of nitre to correct it. Arsenic, in the same manner, if used in excess, is apt to render the glass milky. For a perfectly transparent glass, the pearl ashes are found much superior to lead; perhaps better than any other flux, except it be borax, which is too expensive to be used, except for experiments, or for the best looking-glasses.

The materials for making glass must first be reduced to powder, which is done in mortars or by horse-mills. After sifting out the coarse parts, the proper proportions of silex and flux are mixed together and put into the calcining furnace, where they are kept in a moderate heat for five or six hours, being frequently stirred about during the process. When taken out the matter is called frit. Frit is easily converted into glass by only pounding it, and vitrifying it in the melting pots of this glass furnace: but in making fine glass it will sometimes require a small addition of flux to the frit to correct any fault. For, as the flux is the most expensive article, the manufacturer will rather put too little at first than otherwise, as he can remedy this defect in the melting pot. The heat in the furnace must be kept up until the glass is brought to a state of perfect fusion; and during this process any scum which arises must be removed by ladles. When the glass is perfectly melted, the glass-blowers commence their operations.

The following compositions of the ingredients for glass are extracted from the Handmaid to the Arts:

"For the best flint-glass, 120lbs. of white sand, 50lbs. of red lead, 40lbs. of the best pearl-ashes, 20lbs. of nitre, and five ounces of magnesia; if a pound or two of arsenic be added, the composition will fuse much quicker, and with a lower temperature.

"For a cheaper flint-glass, 120lbs. white sand, 35lbs. of pearl-ashes, 40lbs. red lead, 13lbs. of nitre, six pounds of arsenic, and four ounces of magnesia.

"This requires a long heating to make clear glass; and the heat should be brought on gradually, or the arsenic is in danger of subliming before the fusion commences. A still cheaper composition is made by omitting the arsenic in the foregoing, and substituting common sea salt.

"For the best German crystal glass, 120lbs. of calcined flints or white sand, the best pearl-ashes 70lbs., saltpetre 10lbs., arsenic half a pound, and five ounces of magnesia. Or, a cheaper composition for the same purpose is, 120lbs. of sand or flints, 46lbs. of pearl-ashes, seven pounds of nitre, six pounds of arsenic, and five ounces of magnesia. This will require a long continuance in the furnace; as do all others where much of the arsenic is employed.

"For looking-glass plates, washed white sand 60lbs., purified pearl-ashes 25lbs., nitre 15lbs., and seven pounds of borax. If properly managed, this glass will be colourless. But if it should be tinged by accident, a trifling quantity of arsenic, and an equal quantity of magnesia, will correct it; an ounce of each may be tried first, and the quantity increased if necessary.

"The ingredients for the best crown-glass must be prepared in the same manner as for looking-glasses, and mixed in the following proportions: 60lbs. of white sand, 30lbs. of pearl ashes, and 15lbs. of nitre, borax a pound, and half a pound of arsenic.

"The composition for common green window glass is 120lbs. of white sand, 30lbs. of unpurified pearl ashes, wood ashes well burnt and sifted, 60lbs. common salt 20lbs., and five pounds of arsenic.

"Common green bottle-glass is made from 200lbs. of woodashes, and 100lbs. of sand; or 170lbs. of ashes, 100lbs. of sand, and 50lbs. of the lava of an iron-furnace: these materials must be well mixed."

The materials employed in the manufactory of glass are by chemists reduced to three classes, namely, alkalies, earths, and metallic oxides.

The fixed alkalies may be employed indifferently; but soda is preferred in this country. The soda of commerce is usually mixed with common salt, and combined with carbonic acid. It is proper to purify it from both of these foreign bodies before using it. This, however, is seldom done.

The earths are silica, lime, and sometimes a little alumina. Silica constitutes the basis of glass. It is employed in the state of fine sand or flints; and sometimes, for making very fine glass, rock crystal is employed. When sand is used, it ought if possible to be perfectly white; for when it is coloured with metallic oxides, the transparency of the glass is injured. Such sand can only be employed for very coarse glasses. It is necessary to free the sand from all the loose earthy particles with which it may be mixed, which is done by washing it well with water.

Lime renders glass less brittle, and enables it to withstand better the action of the atmosphere. It ought in no case to exceed the twentieth part of the silica employed, otherwise it corrodes the glass pots. This indeed may be prevented by throwing a little clay into the melted glass; but in that case a green glass only is obtained.

The metallic oxyds employed are the red oxyd of lead or litharge, and the white oxyd of arsenic. The red oxyd of lead, when added in sufficient quantity, enters into fusion with silica, and forms a glass without the addition of any other ingredient. Five parts of minium and two of silica form a glass of an orange-colour and full of striæ. Its specific gravity is five. The red oxyd of lead renders glass less brittle and more fusible; but, when added beyond a certain proportion, it injures the transparency and the whiteness of glass.

The white oxyd of arsenic answers the same purposes with that of lead; but on account of its poisonous qualities it is seldom used. It is customary to add a little nitre to the white oxyd of arsenic, to prevent the heat from reviving it, and rendering it volatile. When added beyond a certain proportion, it renders glass opaque and milky like the dial-plate of a watch. When any com-

bustible body is present, it is usual in some manufactures to add a little white oxyd of arsenic. This supplying oxygen, the combustible is burnt, and flies off; while the revived arsenic is at the same time volatilized.

There are several kinds of glass adapted to different uses. The best and most beautiful are the flint and the plate glass. These, when well made, are perfectly transparent and colourless, heavy and brilliant. They are composed of fixed alkali, pure silicious sand, calcined flints, and litharge, in different proportions. The flint-glass contains a large quantity of oxyd of lead, which by certain processes is easily separated. The plate-glass is poured in the melted state upon a table covered with copper. The plate is cast half an inch thick, or more, and is ground down to a proper degree of thinness, and then polished.

Crown-glass, that used for windows, is made without lead, chiefly of fixed alkali fused with silicious sand, to which is added some black oxyd of manganese, which is apt to give the glass a tinge of purple.

Bottle-glass is the coarsest and cheapest kind: into this little or no fixed alkali enters the composition. It consists of an alkaline earth combined with alumina and silica. In this country it is composed of sand and the refuse of the soap-boiler, which consists of the lime employed in rendering his alkali caustic, and of the earthy matters with which the alkali was contaminated. The most fusible is flint-glass, and the least fusible is bottle-glass.

Flint-glass melts at the temperature of 10° Wedgewood; crown-glass at 30°; and bottle-glass at 47°. The specific gravity varies between 2·48 and 3·33.

Glass is often tinged of various colours by mixing with it while in fusion some one or other of the metallic oxyds; and on this process, well conducted, depends the formation of pastes or factitious gems.

Blue glass is formed by means of oxyd of cobalt.

Green, by the oxyd of iron or of copper.

Violet, by oxyd of manganese.

Red, by a mixture of the oxyds of copper and

Purple, by the purple oxyd of gold.

White, by the oxyd of arsenic and of zinc.

Yellow, by the oxyd of silver and by combustible bodies.

Opticians, who employ glass for optical instruments, often complain of the many defects under which it labours. The chief of these are the following:

Streaks.—These are waved lines, often visible in glass, which interrupt distinct vision. They are probably owing sometimes to want of complete fusion, which prevents the different materials from combining sufficiently; but in some cases also they may be produced by the workmen lifting up, at two different times, the glass which is to go to the formation of one vessel or instrument.

Tears.—These are white specks or knots, occasioned by the vitrified clay of the furnaces, or by the presence of some foreign salt.

Bubbles.—These are air-bubbles which have not been allowed to escape. They indicate want of complete fusion, either from too little alkali, or the application of too little heat.

Cords.—These are asperities on the surface of the glass, in consequence of too little heat.

GLASS-BLOWING. The art of forming vessels of glass is termed blowing, from its being in a great measure performed by the operator blowing through an iron tube, and by that means inflating a piece of glass which is heated so as to become soft and exceedingly pliable. By a series of the most simple and dextrous operations, this beautiful material is wrought into the various utensils of elegance and utility, by methods which require but very few tools, and those of the most simple construction.

The glass-blowers' furnace is of a circular form, as shewn in the plan, fig. 2, Plate 82. It consists of three distinct parts. The lowest is a large arch, which is carried beneath the centre of the furnace: in the plan, fig. 2, this is represented by the dotted lines AA: in the section, fig. 1, nothing of this arch is seen, except part of its upright sides AA. In the centre of the furnace the covering of this arch is wanting, and its place is supplied by a grate, (represented in the plan) upon which the fire is made. The arch AA, which is called the draught arch, is intended to bring a constant supply of fresh air to the furnace. The second part of the furnace is a circular wall KK, of masonry or brick work, strengthened by nine ribs or piers BBB, which extend from the foundation to the top of the furnace, (as shewn in the section). Within the circular wall or waist of the furnace, the crucibles or pots to contain the glass are placed; these are nine in number, and are situated behind the spaces between each pier. The fire is made upon the grate in the centre of the furnace, and its flames are reverberated down upon the pots by a dome DD, fig. 1, called the vault, constructed of fire-bricks. The vault, and indeed the whole superstructure of the furnace, is supported only by the nine piers B: by this means nine apertures are left beneath the vault which are the mouths of the furnace.

The vignette at the top of Plate 81, is a view of the interior of a glass-house, with workmen performing the various operations. In this figure, the nine mouths of the furnaces are represented as partially closed by a screen of fire-bricks, in which are three apertures to give the workman access to the pots; the use of the screen is to defend the workman as much as possible from the heat of the furnace; and the apertures are therefore proportioned to the size of the work to be performed. The nine pots are placed exactly beneath the mouths of the furnace, and are arranged round the furnace upon a circular course of brick-work (EE in the elevation), so that the current of flame reflected from the vault DD, strikes directly upon them. The flame and heated air are carried off from the furnace by nine flues, five of which FFF, are seen in fig. 1, Pl. 82, into an upper dome GG, which is the third part. It has a cylindric chimney HH, erected on the top of it, and carried up some height, to cause sufficient draught for the fire.

The implements used by a glass-blower are neither numerous nor expensive: the principal of them are shewn in fig. 2, Pl. 81. A is the blowing pipe, an iron tube about three feet six inches long, and covered at one end with yarn, to prevent it burning the workman's hand. B is an iron rod, of which the workman has several. D are the pliers, with which the glass is worked: they are made of steel, and the circular part being reduced very thin, acts both as a spring and a joint to the blades. E are shears used in cutting the glass while in a soft and pliable state. F are calipers used for measuring the work occasionally.

To give a general idea of the art of forming glass vessels, it will be necessary to choose some one as an example; for this purpose we have selected a decanter, fig. 6. To form this the glass-blower, or a boy who assists him, introduces his blowing-iron A through the side aperture in the mouth of the furnace, and dipping it into the melted glass, he turns it round at the same time, so as to gather a small quantity of glass at the end of it. Then, taking it from the furnace, he rolls it on the iron plate or marble slab, as represented on the right hand side of the vignette; the boy is seen not far from him.

When he has, by repeating this operation two or three times, accumulated a sufficiency of metal to form the vessel, he blows through the tube, as represented in the centre of the vignette. By this means the glass is inflated like a bladder, fig. 4: and by rolling it again on the slab, it is brought to the proper size. The artizan now seats himself in the seat represented behind each workman, and placing his blowing-pipe across the two pieces of wood, which are exactly similar to the elbows of an arm-chair, he rolls the pipe along the arms with his left hand, while he forms the glass vessel, which projects over the arm with the pliers held in the right hand. This operation is seen at the left hand of the vignette. At the same time that he holds the vessel in the plier D, as shewn in fig. 3, he turns it round by rolling the blowing-iron. By this means it is made truly circular. The end is flattened to make the bottom of the decanter, by the flat blade of the pliers pressed against it, while it is turning round. It is to be observed, that the pliers or any tools which are to touch the glass, must be rubbed with bees-wax, or the cold metal would crack the glass. When these proceedings have brought the decanter to the state of fig. 3, the boy brings the rod B with a small portion of glass at the end; sticking it to the bottom of the vessel, the workman touches the neck with a piece of cold iron, and the glass instantly separates from the blowing-pipe. The boy then heats the glass at the furnace mouth; and when he returns it the workman opens the mouth of the decanter with the point of the pliers, as at fig. 5. The rings on the neck are put on by the boy bringing a piece of hot glass, *a*, fig. 6, and rolling it round the neck: then cutting it off by the shears E, and smoothing it by the pliers, the decanter is broken off from the rod B, and the operation is completed. Another boy now carries it by putting a long stick into the mouth, and thus conveys it into the top compartment of the furnace over the vault. The manner of doing this is shewn at the left-hand side of the furnace. Here the glass remains several hours at a considerable heat, until it is thoroughly annealed, and loses that brittleness which it would have without such an operation. A common glass bottle for wine is first brought to the state of K, fig. 7. This is placed in the mould GH, the two halves of which are shut down together, and the ring *b* put over the handles kk to keep it shut. The workman then blows through his tube B, and inflates the glass so as to fill the mould: by this means all the bottles will be of one size.

Watch-glasses are made by first blowing a hollow globe, the proper radius for the glasses; then by touching it with the iron ring, fig. 8. This cracks out a watch-glass in an instant. The same globe will make several glasses.

Window or table-glass is worked nearly in the manner above described: the workman blows and manages the metal, so that it extends two or three feet in a cylindrical form. It is then carried to the fire, and the operation of blowing repeated till the metal is stretched to the dimensions required, the side to which the pipe is fixed diminishing gradually till it ends in a pyramidal form; but, in order to bring both ends nearly to the same diameter, while the glass continues flexible, a small portion of hot metal is added to the pipe; the whole is drawn out with a pair of iron pincers, and the same end is cut off with a little cold water as before.

The cylinder thus open at one end is returned to the mouth of the furnace, where it is cut by the aid of cold water, after which it is gradually heated on an earthen table, in order to unfold its length, while the workman with an iron tool alternately raises and depresses the two halves of the cylinder: by this process, the latter accommodates itself to the same flat form in

Plate-glass is the last and most valuable kind; and is thus called from its being cast in plates or large sheets: it is almost exclusively employed for mirrors or looking-glasses, and for the windows of carriages.

Plate-glass was formerly blown; but that method having been found very inconvenient, casting was invented; namely, the liquid metal is conveyed from the furnace to a large table, on which it is poured, and all excrescences, or bubbles, are immediately removed by a roller that is swiftly passed over it. It is then annealed in the manner already referred to.

Glass (Painting in). The ancient manner of painting in glass was very simple: it consisted in the mere arrangement of pieces of glass of different colours in some sort of symmetry, and constituted what is now called Mosaic work. (See Mosaic). In process of time they came to attempt more regular designs, and also to represent figures heightened with all their shades: yet they proceeded no farther than the contours of the figures in black with water-colours, and hatching the draperies after the same manner on glasses of the colour of the object they designed to paint. For the carnation they used glass of a bright red colour; and upon this they drew the principal lineaments of the face, &c. with black. At length, the taste for this sort of painting improving considerably, and the art being found applicable to the adorning of churches, palaces, &c. they found out means of incorporating the colours in the glass itself, by heating them in the fire to a proper degree, having first laid on the colours. A French painter at Marseilles is said to have given the first notion of this improvement, upon going to Rome under the pontificate of Julius II.; but Albert Durer and Lucas of Leyden were the first that carried it to any height.

This art, however, has frequently met with much interruption, and sometimes been almost totally lost; of which Mr. Walpole gives the following account in his Anecdotes of Painting in England: "The first interruption given to it was by the reformation, which banished the art out of churches; yet it was in some manner kept up in the escutcheons of the nobility and gentry in the windows of their seats. Towards the end of queen Elizabeth's reign, indeed, it was omitted even there; yet the practice did not entirely cease. The chapel of our Lady at Warwick was ornamented anew by Robert Dudley earl of Leicester and his countess, and the cipher of the glass-painter's name yet remains, with the date 1574; and in some of the

chapels at Oxford the art again appears, dating itself in 1622, by the hand of no contemptible master.

"I could supply even this gap of 48 years by many dates on Flemish glass: but nobody ever supposed that the secret was lost so early as the reign of James I.; and that it has not perished since will be evident from the following series, reaching to the present hour.

"The portraits in the windows of the library at All Souls, Oxford. In the chapel at Queen's College there are twelve windows, dated 1518. P. C. a cipher on the painted glass in the chapel at Warwick, 1574. The windows at Wadham-college; the drawing pretty good, and the colours fine, by Bernard Van Linge, 1622. In the chapel at Lincoln's Inn, a window, with the name Bernard 1623. This was probably the preceding Van Linge. In the church of St. Leonard, Shoreditch, two windows by Baptista Sutton, 1634. The windows in the chapel at University-college, Henry Giles pinxit 1687. At Christ-church, Isaac Oliver, aged 84, 1700. Window in Merton-chapel, William Price, 1700. Windows at Queen's New-college, and Maudlin, by William Price, the son, now living, whose colours are fine, whose drawing is good, and whose taste in ornaments and Mosaic is far superior to any of his predecessors; is equal to the antique, to the good Italian masters, and only surpassed by his own singular modesty.

"It may not be unwelcome to the curious reader to see some anecdotes of the revival of taste for painted glass in England. Price, as we have said, was the only painter in that stile for many years in England. Afterwards one Rowell, a plumber at Reading, did some things, particularly for the late Henry earl of Pembroke; but Rowell's colours soon vanished. At last he found out a very durable and beautiful red; but he died in a year or two, and the secret with him. A man at Birmingham began the same art in 1756 or 1757, and fitted up a window for lord Lyttelton in the church of Hagley, but soon broke. A little after him, one Peckitt at York began the same business, and has made good proficiency. A few lovers of that art collected some dispersed panes from ancient buildings, particularly the late lord Cobham, who erected a Gothic temple at Stowe, and filled it with arms of the old nobility, &c. About the year 1753 one Asciotti, an Italian, who had married a Flemish woman, brought a parcel of painted glass from Flanders, and sold it for a few guineas to the hon. Mr. Bateman of Old Windsor. Upon that I sent Asciotti again to Flanders, who brought me 450 pieces, for which, including the expence of his journey, I paid him 36 guineas. His wife made more journeys for the same purpose; and sold her cargoes to one Palmer, a glazier in St. Martin's-lane, who immediately raised the price to one, two, or five guineas for a single piece, and fitted up entire windows with them, and with mosaics of plain glass of different colours. In 1761 Paterson, an auctioneer at Essex-house in the Strand, exhibited the two first auctions of painted glass, imported in like manner from Flanders. All this manufacture consisted in rounds of scripture-stories, stained in black and yellow, or in small figures of black and white; birds and flowers in colours, and Flemish coats of arms."

The colours used in painting or staining of glass are very different from those used in painting either in water or oil colours. For black, take scales of iron, one ounce; scales of copper, one ounce; jet, half an ounce; reduce them to powder, and mix them. For blue, take powder of blue, one pound; nitre, half a pound; mix them and grind them well together. For carnation, take red chalk, eight ounces; iron scales, and litharge of silver, of each two ounces; gum arabic, half an ounce; dissolve in water, grind all together for half an hour as stiff as you can; then put it in a glass and stir it well, and let it stand to settle fourteen days. For green, take red lead, one pound; scales of copper, one pound; and flint, five pounds; divide them into three parts, and add to them as much nitre; put them into a crucible, and melt them with a strong fire; and when it is cold powder it, and grind it on a porphyry. For gold colour, take silver, an ounce; antimony, half an ounce; melt them in a crucible; then pound the mass to powder, and grind it on a copper plate; add to it yellow ochre, or brick-dust calcined again, fifteen ounces, and grind them well together with water. For purple, take minium, one pound; brown stone, one pound; white flint, five pounds; divide them into three parts, and add to them as much nitre as one of the parts; calcine, melt, and grind it as you did the green. For red, take jet, four ounces; litharge of silver, two ounces; red chalk, one ounce; powder them fine, and mix them. For white, take jet, two parts; white flint, ground on a glass very fine, one part; mix them. For yellow, take Spanish brown, ten parts; leaf-silver, one part; antimony, half a part; put all into a crucible, and calcine them well.

In the windows of ancient churches, &c. there are to be seen the most beautiful and vivid colours imaginable, which far exceed any of those used by the moderns, not so much because the secret of making those colours is entirely lost, as that the moderns will not go to the charge of them, nor be at the necessary pains, by reason that this sort of painting is not now so much in esteem as formerly. Those beautiful works, which were made in the glass-houses, were of two kinds.

In some, the colour was diffused through the whole substance of the glass. In others, which were far the most common, the colour was only on one side, scarce penetrating within the substance above one-third of a line; though this was more or less according to the nature of the colour, the yellow being always found to enter the deepest. These last, though not so strong and beautiful as the former, were of more advantage to the workmen, by reason that on the same glass, though already coloured, they could show other kinds of colours where there was occasion to embroider draperies, enrich them with foliages, or represent other ornaments of gold, silver, &c.

In order to this, they made use of emery, grinding or wearing down the surface of the glass till such time as they were got through the colour to the clear glass. This done, they applied the proper colours on the other side of the glass. By these means, the new colours were hindred from running and mixing with the former, when they exposed the glasses to the fire, as will appear hereafter. When indeed the ornaments were to appear white, the glass was only bared of its colour with emery, without tinging the place with any colour at all; and this was the manner by which they wrought their lights and heightenings on all kinds of colour.

The first thing to be done, in order to paint or stain glass in the modern way, is to design, and even colour the whole subject on paper. Then they choose such pieces of glass as are clear, even, and smooth, and proper to receive the several

parts; and proceed to distribute the design itself, or the paper it is drawn on, into pieces suitable to those of the glass, always taking care that the glasses may join in the contours of the figures and the folds of the draperies; that the carnations and other finer parts may not be impaired by the lead with which the pieces are to be joined together. The distribution being made, they mark all the glasses as well as papers, that they may be known again: which done, applying every part of the design upon the glass intended for it, they copy or transfer the design upon this glass with the black colour diluted in gum-water, by tracing and following all the lines and strokes as they appear through the glass with the point of a pencil.

When these strokes are well dried, which will happen in about two days, the work being only in black and white, they give it a slight wash over with urine, gum arabic, and a little black; and repeat it several times, according as the shades are desired to be heightened; with this precaution, never to apply a new wash till the former is sufficiently dried. This done, the lights and risings are given by rubbing off the colour in the respective places with a wooden point, or the handle of the pencil.

As to the other colours above mentioned, they are used with gum-water, much as in painting in miniature; taking care to apply them lightly, for fear of effacing the outlines of the design; or even, for the greater security, to apply them on the other side; especially yellow, which is very pernicious to the other colours, by blending therewith. And here too, as in pieces of black and white, particular regard must always be had not to lay colour on colour, or put on a new lay, till such time as the former is well dried.

When the painting of all the pieces is finished, they are carried to the furnace to anneal or bake the colours. See ENAMELLING.

Having often been delighted with the grand effect produced by the windows of stained glass in old churches and monasteries, we have regretted that such fine and durable colouring should, in so many cases, have been prostituted upon wretched designs inferior to the productions of our sign-post daubers. We have wished that some mode could be devised of copying and multiplying pictures upon glass—some mechanical mode, which should require the aid of the artist in the first instance only, and leave all the subsequent operations to be performed by inferior hands, as in the case of copper-plate printing. Portraits at least, on a single piece of glass, which should perpetuate the features of great men and beautiful women, secure from that decay of colour and of canvas which has already begun to obliterate the finest paintings of the greatest artists whom the world has ever produced, might possibly be produced in the following way:

Suppose, after the outline of a likeness is drawn, that blocks were cut from it after the same manner as for callicoes, or paper-hangings, only with superior nicety, and in greater number for the purpose of multiplying and better blending the tints.

Enamellers must determine what shall be the proper substances for the different colours, and with what liquid they shall be moistened, that they may be readily taken up by the blocks, and thence transferred to another body by pressure.

From these blocks, and with these colours, let the figure be printed on paper; and, to prevent inaccuracy in bringing the separate parts, cut on the different blocks, to unite into a complete whole, let the paper be placed under a frame secured in an immoveable position during the operation. The blocks being accurately squared, all exactly of the same dimensions, and each nicely fitting the frame, cannot, in passing through it to deliver their several impressions, make the smallest deviation from their intended places, but must produce an exact picture—at least on the paper.

To transfer that impression to glass, is, indeed, a work of nicety and difficulty. Were it not for some smaller strokes which must necessarily be in wood, the entire impression might in the outset be made on the glass itself, without any intervention of paper; since experience has proved to the callico-printers that the great masses of colour cannot be successfully delivered from wood; wherefore they are obliged, in those parts of their patterns, to use bits of smooth worn-out beaver-hat, which might very well be pressed on the glass-plate.

However, from what we every day see effected in the case of prints affixed to glass without any of the paper remaining, and also of copper-plate embellishments upon porcelain and queen's ware, we doubt not that the picture, while fresh, may, by well-managed pressure, be transferred from the paper to an even plate of ground glass coated with a proper gluten which shall not, at least not materially, offuscate its transparency: and experiment must determine whether the paper may afterward be gently drawn or peeled off, or must be burned away, or destroyed by a corrosive liquid, if any such can be found which will not injure the colours.

Suppose, however, the operation of removing the paper to be satisfactorily performed, proceed we now to secure the indelibility of the picture.

Let a square plate of cast-iron, an inch or two in thickness, and as level and smooth as possible, be furnished on every side with a metal ledge rising an inch or more in height, which ought to be in two separate pieces, the one permanently fastened to the plate, the other capable of being removed at pleasure, for the purpose of laying in and taking out the glass without violence.

Within that ledge let the glass be fitted, closely touching it on every side, and lying with the painted surface uppermost. Upon this lay another plate of glass, fitted in the same manner.

Let, now, the metal frame, with the inclosed glasses, be exposed to the action of fire until the glass plates, without being melted to absolute fluidity, shall nevertheless become sufficiently soft to coalesce into one body under a strong pressure. The body which conveys the pressure, and lies in immediate contact with the glass, must equally fit and completely fill the entire space between the ledges, that there be no room for the soft glass to spread in any direction.

Those who have witnessed the process pursued in softening tortoise-shell in the fire, and pressing it into the various shapes of snuff-boxes, *étuis*, &c. &c. will not conceive much difficulty in this use of the glass. It may be managed by the aid of a machine somewhat similar to, but more powerful than, a common printing-press, with a solid metal platine, to fit and fill the frame, as above; though much better contrivances may be found among the multifarious engines employed at Birmingham for the purposes of coining, and striking the heavy dies, than any we can possibly suggest. In whatever manner the two glasses may be pressed into union, the united body may be afterward ground and polished.

GLASS (Muscovy). See MICA.

GLASSES (Musical). See ARMONICA and EUPHON.

GLASSES (Optical). See LENS, MIRROR, OPTICS, &c.

GLASS (Burning). See BURNING GLASS.

GLASS (Cupping). See SURGERY.

GLASS WORT. See SALSOLA.

GLASS (Hour). A glass used in measuring time by the flux of sand (*Shakspeare*). Glass signifies, farther. 1. The destined time of man's life (*Chapman*). 2. A cup of glass used to drink in (*Philips*). 3. The quantity of wine usually contained in a glass; a draught (*Taylor*). 4. A perspective glass (*Dryden*).

GLASS. *a.* Vitreous; made of glass (*Shaks.*).

To GLASS. *v. a.* 1. To see as in a glass; to represent as in a glass or mirror: not in use (*Sydney*). 2. To case in glass (*Shakspeare*). 3. To cover with glass; to glaze (*Boyle*).

GLASS, in surgery, is sometimes employed by surgeons when roughly powdered, as an escharotic to opacities of the cornea.

GLASS OF ANTIMONY. See OXIDUM STIBII VITREUM.

GLASS-WORT (Snail-seeded). See KALI.

GLASS-SHAPED, in botany. See CYATHIFORM.

GLASS (John, M.A.), a minister of the church of Scotland, and founder of a sect, called, in Scotland, Glassites, and in England, Sandemanians; was born at Dundee, in 1638. He was educated at St. Andrew's, and obtained a church near the place of his birth. In 1727 he published a work to prove that the civil establishment of religion is inconsistent with Christianity, for which he was deposed; on which he became the father of a sect. He wrote several controversial tracts, which were published in four vols. 8vo. at Edinburgh. He died at Dundee in 1773.

GLASS (John), son of the above, was born at Dundee in 1725. He was bred a surgeon, but afterwards became captain of a merchant vessel belonging to London. In 1763 he took his wife and daughter to the Brazils; and in 1765 sailed for London, having with him his family and all his property. When he was within sight of Ireland, four of his seamen formed a conspiracy and murdered him, his wife and daughter, the mate, one seaman, and two boys. Having loaded the boat with dollars, they sunk the ship, and landed at Ross, and proceeded to Dublin, where they were apprehended and executed. Glass was a man of talents. He published a work in one vol. 4to. intitled, A Description of Teneriffe.

GLA'SSFURNACE. *s.* (*glass* and *furnace.*) A furnace in which glass is made by liquefaction (*Locke*).

GLA'SSGAZING. *a.* (*glass* and *gazing.*) Finical: often contemplating himself in a mirror (*Shakspeare*).

GLA'SSGRINDER. *s.* (*glass* and *grinder.*) One whose trade is to polish and grind glass.

GLA'SSHOUSE. *s.* (*glass* and *house.*) A house where glass is manufactured (*Addison*).

GLA'SSMAN. *s.* (*glass* and *man.*) One who sells glass (*Swift*).

GLA'SSMETAL. *s.* (*glass* and *metal.*) Glass in fusion (*Bacon*).

GLA'SSWORK. *s.* (*glass* and *work.*) Manufacture of glass (*Bacon*).

GLA'SSWORT *s.* A plant; saltwort (*Mil.*).

GLA'SSY. *a.* (from *glass.*) 1. Made of glass; vitreous (*Bacon*). 2. Resembling glass, as in smoothness or lustre, or brittleness (*Sandys*).

GLASTONBURY, a town of Somersetshire, with a market on Tuesday. It is seated near a high hill called the Tor, and is noted for a famous abbey, some magnificent ruins of which are still remaining; but they have been much diminished for the sake of the stones: however, the curious structure called the abbot's kitchen is entire, and is of a very unusual contrivance. The only manufacture here is stockings; but the chief support of the place is the resort of people to see the ruins of the abbey. The George Inn was formerly called the Abbot's Inn, because it was a receptacle for the pilgrims that came to the abbey. It was pretended that the bodies of Joseph of Arimathea, of king Arthur, and of king Edward the Confessor, were buried here. Glastonbury has two churches. Lat. 51.8 N. Lon. 2.40 W.

GLASTONBURY THORN, in botany. See CRATÆGUS.

GLATZ, a strong town of Bohemia, and capital of a county of the same name. Lat. 50.25 N. Lon. 16.50 E.

GLAUBER (John Rudolph), an industrious chemist, was born in Germany. After passing a considerable time in travel he settled at Amsterdam, about the middle of the seventeenth century. He wrote a number of works, mostly infected with the enigmatical jargon and unintelligible theory of the hermetic philosophy, yet containing some useful facts in true chemistry, and some processes of his own invention. His name is perpetuated in the purgative neutral salt called Glauber's, composed of the sulphuric acid and soda; a valuable remedy, but, together with others of his invention, extolled by himself to an extravagant degree. He kept several of his medicines secret, and made advantage of them as nostrums. Of his works an abridged collection was made in German, which was translated into English in 1689; but they are now consigned to oblivion.

GLAUBER'S SALT. Sulphat of Soda. (See SODA). It is found native; and, according to Bergman, it contains sulphuric acid, soda, and water, in the proportions of 27·15·58; that is, when saturated with water of crystallization. When efflorescent, the native Glauber's salt contains, beside pure sulphat of soda, some oxyd of iron, and portions of muriat and carbonat of soda. It is found in old saltworks, on the borders of the salt lakes in different parts of the world, and on the surface of peat-mosses in France. It is also held in solution in the Natron-lakes of Egypt, and the

mineral springs of Carlsbad. Glauber's salt easily dissolves in water, and shoots into long and beautiful crystals, which contain a large quantity of water; in consequence of which they undergo the aqueous fusion, when exposed to heat. This salt, on account of its efficacy as a purgative, was formerly held in the highest esteem, and was denominated sal mirabile Glauberi. It has been used in some countries as a substitute for soda in the manufacture of white glass.

GLAUCIUM. Horned poppy. In botany, a genus of the class polyandria, order monogynia; calyx two-leaved; petals four; silique superior, linear, two-celled, two or three valved; seeds numerous dotted. Four species: three of them common to the sandy shores and fields of our own country, and one a native of Japan.

GLAUCO'MA. (*glaucoma*, γλαυκωμα, γλαυκος, blue, because of the eye becoming of a blue or sea-green colour.) An opacity of the vitreous humour of the eye which it is difficult to ascertain, and which is only to be known by a very attentive examination of the eye-ball.

GLA'UCOPIS. Wattle-bird. In zoology, a genus of the class aves, order picæ. Bill incurvate, arched, the lower mandible shorter and caranculate, beneath at the base; nostrils depressed, half coloured with a subcartilaginous membrane; tongue subcartilaginous, split, and fringed at the top; feet ambulatory. One species only. G. cinerea; cinereous wattle-bird. Inhabits New Zealand; fifteen inches long, walks on the ground, and seldom perches on trees; feeds on berries, insects, and small birds; makes a hissing and murmuring noise: flesh good. See Nat. Hist. Pl. CXXIV.

GLAUCUS. Ancient writers have recorded many of this name, of whom the following are the most celebrated: 1. A son of Hippolochus, the son of Bellerophon. He assisted Priam in the Trojan war, and had the simplicity to exchange his golden suit of armour with Diomedes for an iron one, whence came the proverb of *Glauci et Diomedis permutatio*, to express a foolish purchase. He behaved with much courage, and was killed by Ajax (*Homer.*) 2. A fisherman of Anthedon, in Bœotia, son of Neptune and Nais, or according to others, of Polybius, the son of Mercury. As he was fishing, he observed that all the fishes which he laid on the grass received fresh vigour as they touched the ground, and immediately escaped from him by leaping into the sea. Having perceived the grass on which he laid the fishes to inspire them with fresh vigour, and to cause them to leap into the sea, he looked, and instantly desired to inhabit the sea. He therefore leaped into it, and was made a sea deity by Oceanus and Tethys, at the request of the gods. After this transformation, he became enamoured of the Nereid Scylla, whose ingratitude was severely punished by Circe. He is represented with a long beard, dishevelled hair, and shaggy eye-brows, and with the tail of a fish. 3. A son of Sisyphus, king of Corinth, by Merope, the daughter of Atlas, born at Potnia, a village of Bœotia. He prevented his mares from having any commerce with the stallions, in the expectation that they would become swifter in running; upon which Venus inspired the mares with such fury, that they tore his body to pieces as he returned from the games, which Adrastus had celebrated in honour of his father. He was buried near Potnia (*Hygin. Virg.*) 4. A son of Minos II. and Pasiphae, who was smothered in a cask of honey, and miraculously brought to life by means of an herb, which had previously been seen by a soothsayer, named Polyidus, to reanimate a serpent (*Apollod. Hygin.*) 5. A son of Epytus, who succeeded his father on the throne of Messenia, about ten centuries before the Augustan age. He introduced the worship of Jupiter among the Dorians, and was the first who offered sacrifices to Machaon, the son of Æsculapius (*Paus.*)

GLAVE. *s.* (*glaive*, Fr.) A broad sword; a falchion (*Fairfax*).

To GLA'VER. *v. n.* (*glave*, Welsh, flattery.) To flatter; to wheedle (*L'Estrange*).

GLAUX, in botany, a genus of the pentandrian monogynian class and order. Natural order of calycanthemæ. Salicariæ, Jussieu. Essential character: calyx one-leafed, bell-shaped; corolless; capsule one-celled, five-valved, five-seeded. There is only one species, viz. G. maritima, sea milk-wort, or black salt-wort. It is common on the sea-coast, and on salt marshes at a distance from the sea; it is a beautiful little plant, enlivening large tracts of the dreary situations where it is found; the whole plant is succulent, and salt to the taste.

To GLAZE. *v. a.* (*to glass*, only accidentally varied.) 1. To furnish with windows of glass (*Bacon*). 2. To cover with glass, as potters do their earthen ware. 3. To overlay with something shining and pellucid (*Grew*).

GLA'ZIER. *s.* (corrupted from *glasier*, or *glassier*, of *glass*.) One whose trade is to make glass windows (*Gay*).

GLAZIER'S VICE, is an instrument for drawing lead. We have given a figure of it at Pl. 76, fig. 4, where PG, QH, are two axles running in the frame KL, ML; C, D, two wheels of iron case-hardened, $1\frac{1}{2}$ inch broad, and of the thickness of a pane of glass; these wheels are fixed to the axles, and run very near one another, their distance not exceeding one-tenth of an inch: across their edges several nicks are cut, the better to draw the lead through. E, F, are two pinions, each of twelve leaves, turning one another and going upon the ends of the axles, which are square, being kept fast there by the nuts P, Q, which are screwed fast with a key. A, B, are two cheeks of iron, case-hardened, and fixed on each side to the case with screws; these are cut with an opening near the two wheels, and set so near to the wheels as to leave a space equal to the thickness of the lead; so that between the wheels and the cheeks there is left a hole of the form represented at N, which is the shape of the lead when cut through. The frame KLML is held together by cross bars

passing through the sides, and screwed on; and a cover is put over the machine to exclude the dust. The whole is screwed down fast to a bench by screw-nails LL. When the vice is used, the lead to be drawn is first cast in moulds, into pieces a foot long, with a gutter on each side. One of these pieces is taken, and an end of it sharpened with a knife; then being put into the hole between the wheels, by turning the handle I the lead is drawn through the vice, and receives the form designed.

GLAZING, in the arts, is the polishing or crusting over earthen ware. When earthen ware is properly baked, it is dipped into a composition called a glaze, made by mixing together in water, till it becomes as thick as cream, fifty-six parts of white lead, twelve of ground flints, and three of ground flint-glass. The ware, by being baked, acquires a strong property of imbibing moisture, and in this state it is called biscuit; when dipped into the glaze, it attracts it into its pores, and the ware becomes presently dry; it is then exposed a second time to the fire, by which means the glaze it has imbibed is melted, and a thin, glassy coat is formed upon the surface. The colour is more or less yellow, according as a greater or less proportion of lead has been used. The lead promotes also the vitrification; the flint serves to give a consistency to the lead during the time of vitrification, and to prevent its becoming too fluid, and running down the sides of the ware, and thereby leaving them unglazed. This kind of glazing by lead is liable to be attacked by acids, and of acting in some degree as a poison; a substitute has therefore been recommended, which consists of equal parts of white glass and soda finely pulverized, and exposed to a strong heat till quite dry, and with this the vessels are varnished or glazed. See POTTERY.

M. Westrumb, an eminent German chemist, was required by the government of Hanover to devise a less pernicious method of glazing earthen ware than any hitherto practised. In consequence of numerous experiments, he has at length published the successful result of several compositions, in which not a particle of lead was employed, and which in his opinion will prove an useful glazing for ordinary vessels. First: 32 parts of sand, 11, 15, or 20 parts of purified potash, and from three to five parts of borax. Second: 32 parts of glass (we suppose flint-glass), 16 parts of borax, and three parts of pure potash. Third: 150 parts of crystallized Glauber's-salt, with eight parts of pulverized charcoal, previously roasted, till it has acquired a grey colour; 16 parts of sand, and eight parts of borax.

Another method of glazing without lead has been invented by M. Nieseman, a potter at Leipzig: it consists of half a pound of saltpetre, half a pound of potash, and one pound of common salt. This composition is not very expensive, and said to produce an enamel not inferior to that prepared with lead. Professor Leonhardi has investigated, and found it eminently useful. We trust, therefore, our potters will in future conscientiously desist from using that pernicious and slowly poisonous metal.

GLEAD, a name used in the northern parts of the kingdom for the *milvus* or *kite*.

GLEAM. *s.* (ȝelioma, Saxon.) Sudden shoot of light; lustre; brightness (*Milton*).

To GLEAM. *v. n.* (from the noun.) 1. To shine with sudden coruscation (*Thomson.*) 2. To shine (*Thomson*).

GLE'AMY. *a.* (from *gleam.*) Flashing; darting sudden coruscations of light (*Pope*).

To GLEAN. *v. a.* (*glaner*, French.) 1. To gather what the reapers of the harvest leave behind (*Dryden.*) 2. To gather any thing thinly scattered (*Shakspeare*).

GLEAN. *s.* (from the verb.) Collection made laboriously by slow degrees (*Dryden*).

GLEA'NER. *s.* (from *glean.*) 1. One who gathers after the reapers (*Thomson.*) 2. One who gathers any thing slow and laboriously (*Locke*).

GLEA'NING. *s.* (from *glean.*) The act of gleaning, or thing gleaned (*Atterbury*).

GLEBE. *s.* (*gleba*, Latin.) 1. Turf; soil; ground (*Dryden.*) 2. The land possessed as part of the revenue of an ecclesiastical benefice (*Spelman*).

GLE'BOUS. } *a.* (from *glebe.*) Turfy
GLE'BY. } (*Prior*).

GLECHOMA. Ground Joy. In botany, a genus of the class didynamia, order gymnospermia. Calyx five-cleft; anthers approaching each other in pairs, and each pair forming a cross. One species only, a well-known native of the hedges of our own country, possessing a pleasant aromatic odour, and formerly employed medicinally, but now completely banished from the medical catalogue. It is eaten by sheep, but by no other cattle; even goats and swine refusing it: horses dislike it, but will eat it when they have no other fodder.

GLEDE. *s.* (ȝlidaȝlide, Saxon.) A kind of hawk. See FALCO.

GLEDITSIA. Honey-locust. Acacia. In botany, a genus of the class polygamia, order monœcia. Herm. calyx four-cleft; corol four-petalled; stamens six, pistil one; legume. Male: calyx three-leaved; corol three-petalled; stamens six. Female: corol five-petalled, pistil one: legume. One species only: a native tree of Virginia and the West Indies. It rises with an erect trunk, to the height of thirty or forty feet, and is propagated by seeds, which must be procured from the place in which the tree grows naturally, as it does not ripen its seeds in this country: the seeds may be sown in spring, upon a bed of light earth, burying them in the ground an inch deep; and, if the spring should prove dry, they must be frequently watered; and, as sometimes they remain two years in the ground, those who desire to save time should sow the seeds in pots, which may be plunged into a moderate hot-bed, to bring up the plants the same season. They must be frequently watered, and gradually inured to the open air: during the summer season, the plants in

pots will require frequent waterings; but those in the full ground will not dry so fast, and need not have any water, unless the season should prove very dry. In autumn, the plants in the pots may be placed under a hot-bed frame, to protect them from frost; and those in the full ground should be covered with mats on the first appearance of a frost. The following April, the plants may be transplanted into nursery-beds, at the distance of six inches, in rows, a foot asunder. If the season should prove dry, they must be watered; and if the surface of the bed be covered with moss, or mulch, to prevent the earth from drying, it will be of great service to the plants. Here they may remain two years, during which time they must be kept clean from weeds; and in the winter there should be some rotten tan, or other mulch, spread over the surface of the ground, to resist the frost. If the plants have thriven well, they will now be fit to transplant to the places where they are designed to remain: the best season for this purpose is late in the spring; they thrive best in a deep light soil, for in strong, shallow ground, they become mossy, and never grow large: they should also have a sheltered situation, for when much exposed to winds, their branches are frequently broken, in the summer-season, in consequence of the weight of their leaves.

GLEE. *s.* (ȝliȝȝe, Saxon.) Joy; merriment; gayety (*Gay*).

Glee, in music, a vocal composition in three or more parts, generally consisting of more than one movement, and the subject of which, notwithstanding the received sense of the word Glee, may be either gay, tender, or grave; bacchanalian, amatory, or pathetic. When the glee was first introduced in England is not exactly known, but it is of modern invention, and was originally, as appears evident from its name, confined to themes of cheerfulness and conviviality. (*Busby*).

GLEED. *s.* (from ȝlopan, Saxon, to glow.) A hot glowing coal: obsolete.

GLE'EFUL. *a.* (*glee* and *full.*) Gay; merry; cheerful: not used (*Shakspeare*).

GLEEK. *s.* (ȝ'ɼȝȝe, Saxon.) Musick; or musician (*Shakspeare*).

To Gleek. *v. a.* (ȝliȝman, in Saxon, is a mimick or a droll.) To sneer; to gibe; to droll upon (*Shakspeare*).

To GLEEN. *v. n.* To shine with heat or polish (*Prior*).

GLEET. See Blennorrhagia.

To Gleet. *v. n.* (from the noun). 1. To drip or ooze with a thin sanius liquor (*Wise.*). 2. To run slowly (*Cheyne*).

GLEE'TY. *a.* (from *gleet.*) Ichorous; thinly sanious (*Wiseman*).

GLEICHE'NIA. In botany, a genus of the class cryptogamia, order filices. Fructification three or four together, oval, sessile, half immersed in an hemispheric hollow of the segments of the frond, one-celled, two-valved; seeds numerous, roundish. Two species, both exotics.

GLEN. *s.* (*gleann*, Erse.) A valley; a dale; a depression between two hills (*Spenser*).

GLENCOE (Vale of), a valley, near the head of Loch Etive, in Argyleshire; noted for a cruel massacre of its inhabitants in 1691.

GLENCROY (Vale of), a wild and romantic tract, near the N. E. extremity of Loch Loung, in Argyleshire. The two ranges of mountains, which overhang this valley, approach each other, and between these the traveller is immured. Their stupendous height, and the roaring of numerous cataracts, that pour over their broken surface, produce an awful effect.

GLENOID CAVITY. (*cavitas glenoides*; γληνοειδος, from γληνη, a cavity, and ειδος, resemblance). In anatomy, the articular cavity of the scapula.

GLENLUCE, a town in Wigtonshire, seated on the river Luce, near its entrance into the bay of that name, 16 miles W. by S. of Wigton.

GLENSHEE (Spital of), a noted pass of the Grampian mountains, in Scotland, a little S. of the point where the counties of Perth, Angus, and Aberdeen, meet.

GLEW. *s.* (*gluten*, Latin.) A viscous cement. See Glue.

GLIB. *a.* (from λειος, *Skinner.*) 1. Smooth; slippery; so formed as to be easily moved (*Burnet.*) 2. Smooth; voluble (*Shakspeare*).

Glib. *s.* A thick curled bush of hair hanging down over the eyes (*Spenser*).

To Glib. *v. a.* (from the adjective.) To castrate (*Shakspeare*).

GLI'BLY. *ad.* (from *glib.*) Smoothly; volubly (*Government of the Tongue*).

GLI'BNESS. *s.* (from *glib.*) Smoothness; slipperiness (*Chapman*).

To GLIDE. *v. n.* (ȝliban, Saxon.) 1. To flow gently and silently (*Fairfax.*) 2. To pass on without change of step (*Dryd.*) To move swiftly and smoothly along (*Shakspeare*).

Glide. *s.* (from the verb.) Lapse; act or manner of passing smoothly (*Shakspeare*).

GLI'DER. *s.* (from *glide.*) One that glides.

GLIKE. *s.* (ȝliȝ, Saxon. See Gleek.) A sneer: a scoff; not in use (*Shakspeare*).

To GLI'MMER. *v. n.* (*glimmer*, Danish.) 1. To shine faintly (*Shakspeare.*) 2. To be perceived imperfectly; to appear faintly (*Wot.*).

Glimmer, in oryctology. See Mica.

Gli'mmer. *s.* (from the verb.) Faint splendour; weak light.

GLIMPSE. *s.* (*glimmen*, Dutch.) 1. A weak faint light (*Locke.*) 2. A quick flashing light (*Milton.*) 3. Transitory lustre (*Dryden.*) 4. Short fleeting enjoyment (*Prior.*) 5. A short transitory view (*Hakewill.*) 6. The exhibition of a faint resemblance (*Shakspeare*).

GLINUS, in botany, a genus of the class dodecandia, order pentagynia. Calyx five-leaved; corolless; nectaries cloven bristles; capsule five-angled, five-celled, five-valved, many-seeded. Three species; natives of Asia, with shrubby stems and hoary or hairy leaves: lower lip three-parted; receptacle chaffy. Nine

species, chiefly natives of the south of France and the Levant. The following alone are worthy of notice.

1. G. vulgaris. Blue-daisy. Stem herbaceous, slender, simple one-flowered; root-leaves petioled, clustered, emarginate with a point within the notch; stem-leaves alternate, nearly sessile, three-toothed. Flowers blue. Common to many parts of Europe.

2. G. alypum. Stem shrubby; leaves lanceolate, three-toothed and entire; heads terminal. The leaves are employed in Spain as a powerful cathartic; and often as an antidote to the poison of siphilis. The plant grows indigenously in Spain, France, and Italy.

GLIRES. The fourth order of the class mammalia, in the Linnéan system of zoology: thus ordinally characterised: fore-teeth two in each jaw, approximate, remote from the grinders; tuskless. See Zoology.

GLISSON (Francis,) a learned English physician in the 17th century, was educated at Cambridge, and was made regius professor of that university. In 1634 he was admitted a fellow of the college of physicians in London. During the civil wars he practised physic at Colchester, and afterwards settled in London. He greatly improved physic by his anatomical dissections and observations, and made several new discoveries of singular use towards establishing a rational practice. He wrote, 1. *De rachitide*, &c. 2. *De lymphæductis nuper repertis*; with the *Anatomica prolegomena, & Anatomia hepatis*. 3. *De naturæ substantia energetica; seu de via vitæ naturæ, ejusque tribus primis facultatibus*, &c. quarto. 4. *Tractatus de ventriculo & intestinis*, &c. The world is obliged to him for the *capsula communis*, or *vagina portæ*.

GLIST, in oryctology. See Mica.

To GLI'STEN. *v. n.* (*glittan*, German.) To shine; to sparkle with light (*Thomson*).

To GLI'STER. *v. n.* (*glisteren*, Dutch.) To shine; to be bright (*Spenser*).

Gli'ster. *s.* See Clyster.

To GLI'TTER. *v. n.* (glitinan, Saxon.) 1. To shine; to exhibit lustre; to gleam (*Dry.*) 2. To be specious; to be striking (*Young*).

Gli'tter. *s.* (from the verb.) Lustre; bright show; splendour (*Collier*).

GLI'TTERAND. *part.* Shining; sparkling.

GLI'TTERINGLY. *ad.* (from *glitter*.) With shining lustre.

To GLOAR. *v. a.* (*gloeren*, Dutch.) To squint; to look askew (*Skinner*).

To GLOAT. *v. n.* To cast side glances as a timorous lover (*Rowe*).

GLO'BARD. *s.* (from *glow*.) A glow-worm.

GLO'BATED. *a.* (from *globe*.) Formed in shape of a globe; spherical; spheroidical.

GLOBATE GLAND. A lymphatic gland. See Gland.

GLOBBA, in botany, a genus of the class diandria, order monogynia. Corol equal, three-cleft; calyx superior, three-cleft; capsules three-celled; seeds numerous. Four species, herbaceous plants of India.

GLOBE, in geometry, one of the round bodies more usually called a *sphere*: it is bounded by one uniform convex surface, every point of which is equally distant from a certain point within called the centre.

For Euclid's definition, see the article Geometry.

If d denote the diameter of the globe,
c the circumference,
a the altitude of any segment, and
$p = 3{\cdot}1416$; then

	The surface.	The solidity.
In the Globe	$pd^2 = cd$	$\frac{1}{6}pd^3$
In the Segt.	pad	$\frac{1}{6}pa^2 + \overline{3d-2a}$

See the article Sphere.

Globe, or Artificial globe, is more particularly used for a globe of metal, plaister, paper, pasteboard, &c. on the surface of which is drawn a map, or representation of either the heavens or the earth, with the several circles conceived upon them. And hence

Globes are of two kinds, terrestrial, and celestial; which are of considerable use in geography and astronomy, by serving to give a lively representation of their principal objects, and for performing and illustrating many of their operations in a manner easy to be perceived by the senses, and so as to be conceived even without any knowledge of the mathematical grounds of those sciences.

Description of the Globes.—The fundamental parts that are common to both globes, are an axis, representing the axis of the world, passing through the two poles of a spherical shell, representing those of the world, which shell makes the body of the globe, upon the external surface of which is drawn the representation of the whole surface of the earth, sea, rivers, islands, &c. for the terrestrial globe, and the stars and constellations of the heavens, for the celestial one; besides the equinoctial and ecliptic lines, the zodiac, and two tropics and polar circles, and a number of meridian lines. There is next a brazen meridian, being a strong circle of brass, circumscribing the globe, at a small distance from it quite round, in which the globe is hung by its two poles, upon which it turns round within this circle, which is divided into 4 times 90 degrees, beginning at the equator on both sides, and ending with 90 at the two poles. There are also two small hour circles, of brass, divided into twice 12 hours, and fitted on the meridian round the poles, which carry an index pointing to the hour. The whole is set in a wooden ring, placed parallel to, and representing the horizon, in which the globe slides by the brass meridian, elevating or depressing the pole according to any proposed latitude. There is also a thin slip of brass, called a quadrant of altitude, made to fit on occasionally upon the brass meridian, at the highest or vertical point, to measure the altitude of any thing above the horizon. A magnetic compass is sometimes set underneath.

The late Mr. George Adams made some improvements in the construction of the globes. His globes, like others, are suspended at their poles in a strong brass circle NZÆS (see the figure of the celestial globe in Plate 83,) and turn therein upon two iron pins which form the axis. They have each a thin brass semicircle NHS moveable about these poles, with a small, thin sliding circle H thereon; which semicircle is divided into two quadrants of 90 degrees each, from the equator to both the poles. On the terrestrial globe this semicircle is a moveable meridian, and its small sliding circle, which is divided into a

few points of the compass, is the visible horizon of any particular place to which it is set. On the celestial globe this semicircle is a moveable circle *of declination, and its small annexed circle an artificial sun or planet.* Each globe has a brass wire TWY placed at the limits of the crepusculum or twilight, which, together with the globe, is mounted in a wooden frame, having underneath a magnetic needle in a compass-box. On the strong brass circle of the terrestrial globe, and about 23½ degrees on each side of the north pole, the days of each month are laid down according to the sun's declination; and this brass circle is so contrived, that the globe may be placed with the north and south poles in the plane of the horizon, and with the south pole elevated above it. The equator on the surface of either globe serves the purpose of the horary circle, by means of a semicircular wire placed in the plane of the equator ÆF, carrying two indices, one on the east, the other on the west side of the strong brass circle: one of which is occasionally to be used to point out the time upon the equator. In these globes, therefore, the indices being set to the particular time on the equator, the globes are turned round, and the indices point out the time by remaining fixed; whereas, in the globes as generally mounted, the indices move over the horary circles while the globe is moving, and thus point out the change of time. For farther particulars of these globes, and the method of using them, see Adams's Treatise on the Construction and Use of the Globes.

Mr. G. Wright, of London, has yet farther simplified the construction of the hour-circle, and it is thereby rather less operose. It consists of the following particulars:—There are engraved on the globes two hour-circles, one at each of the poles; which are divided into a double set of twelve hours, as usual in the common brass ones, except that the hours are figured round both to the right and left. The hour-hand or index is placed in such a manner under the brass meridian, as to be moveable at pleasure to any required part of the hour circle, and yet remain there fixed during the revolution of the globe on its axis, and is entirely independent of the poles of the globe. In this manner, the motion of the globe round its axis carrying the hour-circle, the fixed index serves to point out the time, the same as in the reverse way by other globes.

There is a small advantage in having the hour-circle figured both ways, as one hour serves as a complement to XII for the other, and the time of sun rising and setting, and *vice versa,* may both be seen at the same time on the hour-circle. In the problems generally to be performed, the inner circle is the circle of reckoning, and the outer one only the complement. Fig. 5. is a representation of the globe, with Mr. Wright's improved hour-circle at C.

In the Philos. Trans. for 1789, p. 1, Mr. Smeaton has proposed some improvements of the celestial globe, especially with respect to the quadrant of altitude, for the resolution of problems relating to the azimuth and altitude. The difficulty, he observes, that has occurred in fixing a semicircle, so as to have a centre in the zenith and nadir points of the globe, at the same time that the meridian is left at liberty to raise the pole to its desired elevation, I suppose, has induced the globe-makers to be contented with the strip of thin flexible brass, called the quadrant of altitude; and it is well known how imperfectly it performs its office. The improvement I have attempted, is in the application of a quadrant of altitude of a more solid construction; which being affixed to a brass socket of some length, and this ground, and made to turn upon an upright steel spindle, fixed in the zenith, steadily directs the quadrant, or rather arc, of altitude to its true azimuth, without being at liberty to deviate from a vertical circle to the right hand or left; by which means the azimuth and altitude are given with the same exactness as the measure of any other of the great circles. For a more particular description of this improvement, illustrated with figures, see the place above quoted.

The globes commonly used are composed of plaster and paper in the following manner:—A wooden axis is provided, somewhat less than the intended diameter of the globe, and into the extremes thereof two iron wires are driven for poles: this axis is to be the basis of the whole structure. On the axis are applied two hemispherical caps, formed on a kind of wooden mould or block. These caps consist of pasteboard or paper, laid one lay after another on the mould to the thickness of a crown-piece; after which, having stood to dry and embody, making an incision along the middle, the two caps thus parted are slipped off the mould. They remain now to be applied on the poles of the axis, as before they were on those of the mould: and to fix them in their new place, the two edges are sewed together with packthread, &c. The rudiments of the globe being laid, they proceed to strengthen and make it smooth and regular. In order to this, the two poles are hasped in a metalline semicircle of the size intended; and a kind of plaster made of whiting, water, and glue, heated, melted, and incorporated together, is daubed all over the paper-surface. In proportion as the plaster is applied, the ball is turned round in the semicircle, the edge whereof pares off whatever is superfluous and beyond the due dimension, leaving the rest adhering in places that are short of it. After such application of plaster the ball stands to dry; which done, it is put again in the semicircle, and fresh matter applied. thus they continue alternately to apply the composition and dry it, till such time as the ball every where accurately touches the semicircle; in which state it is perfectly smooth, regular, and complete. The ball being finished, it remains to paste the map or description thereon: in order to this, the map is projected in several gores or gussets; all which join accurately on the spherical surface, and cover the whole ball. To direct the application of these gores, lines are drawn by a semicircle on the surface of the ball, dividing it into a number of equal parts corresponding to those of the gores, and subdividing those again answerably to the lines and divisions of the gores. When papers are pasted on, there remains nothing but to colour and illuminate the globe, and to varnish it, the better to resist dust, moisture, &c. The globe itself finished, they hang it in a brass meridian, with an hour-circle and a quadrant of altitude, and thus fit it into a wooden horizon.

To describe the gores or gussets for the globes. In Chambers's Dictionary the following method is directed: "1. From the given diameter of the globe find a right line AB, fig. 1. Pl. 83. equal to the circumference of a great circle, and divide it into twelve equal parts. 2. Through the several points of division, 1, 2, 3, 4, &c. with the inter-

val of ten of them, describe arches mutually intersecting each other in D and E; these figures or pieces, duly pasted or joined together, will make the whole surface of the globe. 3. Divide each part of the right line AB into thirty equal parts, so that the whole line AB, representing the periphery of the equator, may be divided into 360 degrees. 4. From the poles D and E, fig. 2. with the interval of 23½ deg. describe arches *ab*; these will be twelfth-parts of the polar circles. 5. After the like manner, from the same poles D and E, with the interval of 66½ deg. reckoned from the equator, describe arches *cd*; these will be twelfth-parts of the tropics. 6. Through the degree of the equator *e*, corsesponding to the right ascension of any given star and the poles D and E, draw an arch of a circle, and, taking in the compasses the complement of the declination from the pole D, describe an arch intersecting it in *i*; this point *i* will be the place of that star. 7. All the stars of a constellation being thus laid down, the figure of the constellation is to be drawn according to Bayer, Hevelius, or Flamstead. 8. Lastly, after the same manner are the declinations and right ascensions of each degree of the ecliptic *dg* to be determined. 9. The surface of the globe thus projected on a plane is to be engraven on copper, to save the trouble of doing this over again for each globe. If the declinations and right ascensions of the stars be not given, but the longitudes and latitudes in lieu thereof, the surface of the globe is to be projected after the same manner as before, except that in this case D and E, fig. 2. are the poles of the ecliptic, and *fh* the ecliptic itself; and that the polar circles and tropics, with the equator *gd*, and the parallels thereof, are to be determined from their declinations.

M. De La Lande, in his Astronomie, 1771, tom. 3. p. 736, describes the following methods: "To construct celestial and terrestrial globes, gores must be engraved, which are a kind of projection or inclosure of the globe (fig. 3.) similar to what is now to be explained. The length PC of the axis of this curve is equal to a quarter of the circumference of the globe; the intervals of the parallels on the axis PC are all equal, the radii of the circles KDI, which represent the parallels, are equal to the cotangents of the latitudes; and the arches of each, as DI, are nearly equal to the number of the degrees of the breadth of the gore, (which is usually 30°) multiplied by the sine of the latitude: thus there will be found no intricacy in tracing them; but the difficulty proceeds from the variation found in the trial of the gores when pasting them on the globe, and of the quantity that must be taken from the paper, less on the sides than in the middle (because the sides are longer), to apply it exactly to the space that it should cover.

"The method used among workmen to delineate the gores, and which is described by Mr. Bion (Usage des Globes, tome 3.) and by Mr. Robert de Vaugenby, in the 7th volume of the Encyclopédie, is little geometrical, but yet is sufficient in practice. Draw on the paper a line AC, equal to the chord of 15°, to make the half breadth of the gore; and a perpendicular PC, equal to three times the chord of 30°, to make the half length; for these papers, the dimensions of which will be equal to the chords, become equal to the arcs themselves when they are pasted on the globe. Divide the height CP into nine parts, if the parallels are to be drawn in every 10°; divide also the quadrant BE into nine equal parts through each division point of the quadrant, as G; and through the corresponding point D of the right line CP draw the perpendiculars HGF and DF, the meeting of which in F gives one of the points of the curve BEP, which will terminate the circumference of the gore. When a sufficient number of points are thus found, trace the outline PIB with a curved rule. By this construction are given the gore breadths which are on the globe, in the ratio of the confines of the latitudes; supposing these breadths, taken perpendicular to CD, which is not very exact (but it is impossible to prescribe a rigid operation,) sufficient to make a plane which shall cover a curved surface, and that on a right line AB shall make lines PA, PC, PB, equal among themselves, as they ought to be on the globe. To describe the circle KDI which is at 30° from the equator: there must be taken above D a point, which shall be distant from it the value of the tangent of 60°, taken out either from the tables, or on a circle equal to the circumference of the globe to be traced; this point will serve as a centre for the parallel DI, which should pass through the point D, for it is supposed equal to that of a cone circumscribing the globe, and which would touch at the point D. "The meridians may be traced to every 10 degrees by dividing each parallel, as KI, into three parts at the points L and M, and drawing from the pole P, through all these division points, curves, which represent the intermediate meridians between PA and PB (as BR and ST, fig. 4.). The ecliptic may be described by means of the known declination from different points of the equator that may be found in a table; for 10°, it is 3° 58; for 20°, 7° 50′; for 30°, 11° 29′, &c.

It is observed in general, that the paper on which charts are printed, such as the colombier, shortens itself $\frac{1}{72}$ part or a line in six inches upon an average, when it is dried after printing; this inconvenience must therefore be corrected in the engraving of the gores; if, notwithstanding that, the gores are found too short, it must be remedied by taking from the surface of the ball a little of the white with which it is covered, thereby making the dimensions suitable to the gore as it was printed. But what is singular is, that in drawing the gore, moistened with the paste to apply on the globe, the axis GH lengthens, and the side AK shortens, in such a manner, that neither the length of the side ACK nor that of the axis GEH of the gore are exactly equal to the quarter of the circumference of the globe, when compared to the figure on the copper, or to the numbered sides shown in fig. 4. Mr. Bonne having made several experiments on the dimensions that gores take after they had been parted ready to apply to the globe, and particularly with the paper named jesus that he made use of for a globe of one foot in diameter, found that it was necessary to give to the gores on the copper the dimensions shewn in fig. 4. Supposing that the radius of the globe contained 720 parts, the half breadth of the gore is AG=188$\frac{5}{10}$, the distance AC for the parallel of 10 degrees taken on the right line LM is 128.1, the small deviation from the parallel of 10 degrees in the middle of the gore ED is 4, the line ABN is right, the radius of the parallel of 10°, or of the circle CBE, is 4083; and so of the others as marked in

the figure. The small circular cap, which is placed under H, has its radius 253, instead of 274, which it would have if the sine of 20° had been the radius of it.—For the uses, &c. of the globes, we refer to some of the many treatises which have been written upon this subject; among the best of which we reckon those of Adams, Bransby, Butler, Davis, Harris, and Molineux.

Very large globes have been made in different parts of Europe, as at Gottorp, Paris, &c. but we believe they are all inferior in size to one erected at Pembroke college, Cambridge, under the direction of the late Dr. Long. The description of this machine is here added in the doctor's own words:

"I have, in a room lately built in Pembroke-hall, erected a sphere of eighteen feet diameter, wherein thirty persons may sit conveniently; the entrance into it is over the south pole by six steps: the frame of the sphere consists of a number of iron meridians, not complete semicircles, the northern ends of which are screwed to a large round plate of brass, with a hole in the centre of it; through his hole, from a beam in the ceiling, comes the north pole, a round iron rod, about three inches long, and supports the upper parts of the sphere to its proper elevation for the latitude of Cambridge: the lower part of the sphere, so much of it as is invisible in England, is cut off; and the lower or southern ends of the meridians, or truncated semicircles, terminate on, and are screwed down to, a strong circle of oak, of about thirteen feet diameter, which when the sphere is put into motion, runs upon large rollers of lignum vitæ, in the manner that the tops of some windmills are made to turn round. Upon the iron meridians is fixed a zodiac of tin, painted blue, whereon the ecliptic and heliocentric orbits of the planets are drawn, and the constellations and stars traced: the great and little bear, and draco, are already painted in their places round the north-pole; the rest of the constellations are proposed to follow: the whole is turned round with a small winch, with as little labour as it takes to wind up a jack, though the weight of the iron, tin, and wooden circle, is about a thousand pounds. When it is made use of, a planetarium will be placed in the middle thereof. The whole, with the floor, is well supported by a frame of large timbers." Since this was written, in 1758, the constellations and chief stars visible at Cambridge have been painted in their proper places upon plates of iron joined together, which form one concave surface.

We are sorry to remark that, since the death of Dr. Long, this curious structure appears to have been much neglected, and now exhibits strong tokens of decay: although, if we are not misinformed, the doctor in his will made ample provision for keeping it in constant repair.

Globe fish. See Astracion.

Globe amaranthus, in botany. See Gomphræna.

Globe daisy, in botany. See Globularia.

Globe ranunculus, in botany. See Tollius.

Globe thistle, in botany. See Echinops.

GLOBOSE. Globular, or spherical, a term in botany, applied to the roots, heads and corols of plants: a globular root, roundish, with lateral fibres; as in Bunium, Ranunculus. A globular head of flowers, round on all sides. A globular corol; a corol or flower round like a ball; as in Trollius. It is applied also to the receptacle, to the germ, and to seeds. A globular-depressed pericarp. A flatted-globular, or more properly an oblate spheroidal pericarp or fruit.

GLOBO'SITY. *s.* (from *globose*.) Sphericity; sphericalness (*Ray*).

GLO'BOUS. *a.* (*globosus*, Latin.) Spherical; round (*Philips*).

GLO'BULAR. *a.* (*globulus*, Latin.) In form of a small sphere; round; spherical (*Grew*).

GLOBULA'RIA. In botany, a genus of the class tetrandria, order monogynia. Common-calyx imbricate; proper tubular, inferior; upper lip of the corollet two-parted, lower three-parted; receptacle, chaffy. There are eight species; though only one, G. vulgaris, or common blue daisy, is to be met with in our gardens

GLO'BULE. *s.* (*globule*, Fr. *globulus*, Lat.) Such a small particle of matter as is of a globular or spherical figure; as the red particles of the blood (*Newton*).

GLO'BULOUS. *a.* (from *globule*.) In form of a small sphere; round (*Boyle*).

GLOBUS HYSTERICUS. In medicine. The air rising in the œsophagus, and prevented by spasm from reaching the mouth, is so called by authors, because it mostly attends hysteria, and gives the sensation of a ball ascending in the throat.

GLOCESTER. See Gloucester.

GLOGAW, a strong town of Silesia, in Germany, and capital of a duchy of the same name. It was taken by the king of Prussia in 1741. Lat. 51. 40 N. Lon. 16. 31 E.

Glogaw the less, a town of Silesia, in the duchy of Opelen, belonging to the king of Prussia. It is three miles S. E. of Great Glogaw. Lat. 51. 38 N. Lon. 16. 33 E.

GLOME, in botany, a roundish head of flowers.

GLOMERATE (*glomero*, from *glomus*, a clue of yarn or thread), in botany, applied to the spike and panicle. A glomerate spike; (spiculis varie congestis;) having the spikelets or component spikes variously heaped together: as in panicum italicum. A glomerate panicle is exemplified in poa ciliaris, and dactylis glomerata. The flowers grow pretty close together, in a globular or sub-globular form. Scaliger derives glomus from globus; but others on the contrary derive globus from glomus.

Glomerate gland, in medicine, a gland formed of a glomer of sanguineous vessels, having no cavity, but furnished with an excretory duct; as the lachrymal and mammary glands.

To Glo'merate. *v. a.* (*glomero*, Latin.) To gather into a ball or sphere.

GLOMERATION. *s.* (*glomeratio*, Latin.) 1. The act of forming into a ball or sphere. 2. A body formed into a ball (*Bacon*).

GLOMERELLS, in our old writers, commissaries appointed to determine differences between scholars of a school or university, and the townsmen of the place.

GLO'MEROUS. *a.* (*glomerosus*, Latin.) Gathered in a ball or sphere.

GLOMERULE. (dimin. from *glomus*.) In botany. A small glome.

GLOMME, a river of the province of Aggerhuys, in S. Norway, which flows into the North Sea, at Fredericstadt.

GLOOM. *s.* (ᵹlomanᵹ, Saxon, twilight.) 1. Imperfect darkness; dismalness; obscurity; defect of light (*Milton*). 2. Cloudiness of aspect; heaviness of mind; sullenness.

To GLOOM. *v. n.* (from the noun.) 1. To shine obscurely, as the twilight (*Spen.*) 2. To be cloudy; to be dark. 3. To be melancholy; to be sullen.

GLOO'MILY. *ad.* (from *gloomy*.) 1. Obscurely; dimly; without perfect light; dismally. 2. Sullenly; with cloudy aspect; with dark intentions; not cheerfully (*Dryden*).

GLOO'MINESS. *s.* (from *gloomy*.) 1. Want of light; obscurity; imperfect light; dismalness. 2. Want of cheerfulness; cloudiness of look; heaviness of mind; melancholy (*Collier*).

GLOO'MY. *a.* (from *gloom*.) 1. Obscure; imperfectly illuminated; almost dark; dismal for want of light (*Dryden*). 2. Dark complexion (*Milton*). 3. Sullen; melancholy; cloudy of look; heavy of heart.

GLORIA PATRI, among ecclesiastical writers. See DOXOLOGY.

GLO'RIED. *a.* (from *glory*.) Illustrious; honourable: not in use (*Milton*).

GLORIFICA'TION. *s.* (*glorification*, Fr.) The act of giving glory (*Taylor*).

To GLO'RIFY. *v. a.* (*glorifier*, French.) 1. To procure honour or praise to one (*Dan.*). 2. To pay honour or praise in worship (*Hook*). 3. To praise; to honour; to extol (*Donne*). 4. To exalt in heaven (*Romans*).

GLORI'OSA. In botany, a genus of the class hexandria, order monogynia. Corol six-petalled, undulate, entirely reflected; style oblique. Two species. 1. G. superba. Superb lily, with leaves ending in a tendril; an elegant plant, not unfrequently found in our green-houses, but a native of Malabar. The roots and every part of the plant are poisonous. 2. G. simplex. Simple gloriosa: a native of Senegal, with pointed leaves, climbing stem, and blue flowers.

GLO'RIOUS. *a.* (*gloriosus*, Latin.) 1. Boastful; proud; haughty (*Bacon*). 2. Noble; illustrious; excellent (*Addison*).

GLO'RIOUSLY. *ad.* (from *glorious*.) Nobly; splendidly; illustriously (*Pope*).

GLORY. *s.* (*gloria*, Latin.) 1. Praise paid in adoration (*Luke*). 2. The felicity of heaven prepared for those that please God (*Milton*). 3. Honour; praise; fame; renown; celebrity (*Sidney*). 4. Splendour; magnificence (*Matthew*). 5. Lustre; brightness (*Pope*). 6. A circle of rays which surrounds the heads of saints in picture (*South*). 7. Pride; boastfulness; arrogance (*Young*). 8. Generous pride (*Sidney*).

To GLO'RY. *v. n.* (*glorior*, Latin.) To boast in; to be proud of (*Sidney*).

To GLOSE. *v. a.* To flatter; to collogue.

GLOSS. *s.* (γλωσσα; *glose*, French.) 1. A scholium; a comment (*Davies*). 2. Superficial lustre (*Addison*). 3. An interpretation artfully specious; a specious representation (*Hooker*).

To GLOSS. *v. n.* (*gloser*, French.) 1. To comment (*Dryden*). 2. To make sly remarks (*Prior*).

To GLOSS. *v. a.* 1. To explain by comment (*Donne*). 2. To palliate by specious exposition or representation (*Hooker*). 3. To embellish with superficial lustre (*Dryden*).

GLO'SSARY. *s.* (*glossarium*, Latin.) A dictionary of obscure or antiquated words (*Baker*).

GLOSSA'TOR. *s.* (*glossateur*, French.) A writer of glosses; a commentator (*Ayliffe*).

GLO'SSER. *s.* (*glossarius*, Lat.) 1. A scholiast; a commentator. 2. A polisher.

GLO'SSINESS. *s.* (from *glossy*.) Smooth polish; superficial lustre (*Boyle*).

GLO'SSO, in anatomy, (from γλωσσα, the tongue.) Names compounded with this word belong to muscles, nerves, or vessels, from their being attached, or going to the tongue.

GLOSSO-PHARYNGEAL NERVES. The ninth pair of nerves. They arise from the processes of the cerebellum, which run to the medulla spinalis, and terminate by numerous branches in the muscles of the tongue and pharynx.

GLOSSO-PHARYNGEUS. (Musculus glossopharyngæus, γλωσσοφαρυγγαιος from γλωσσα the tongue, and φαρυγξ the pharynx: so named from its origin in the tongue, and its insertion in the pharynx.) See CONSTRICTOR PHARYNGIS SUPERIOR.

GLOSSO-STAPHILINUS. (Musculus glosso-staphylinus, γλωσσοσταφυλινος from γλωσσα the tongue, and σταφυλινος the staphylinus.) See CONSTRICTOR ISTHMI FAUCIUM.

GLO'SSOGRAPHER. *s.* (γλωσσα and γραφω.) A scholiast; a commentator.

GLO'SSOGRAPHY. *s* (γλωσσα and γραφω.) The writing of commentaries.

GLOSSO'MA. In botany, a genus of the class tetrandria, order monogynia. Calyx four-toothed; corol four-petalled; anthers cohering by a membrane; stigma four-cleft; drupe with a grooved one-seeded nut. One species, a native of Guiana: a shrub branched at top, with leaves opposite, oblong, pointed, glabrous, very entire, flowers white, in axillary cymes.

GLOSSOPE'TALUM. In botany, a genus of the class pentandria, order pentagynia. Calyx half inferior; five-toothed; corol five-petalled with a linear-lanceolate ligule at the tip of each: berry five-seeded. Two species,

both natives of Guiana, trees from fifty to sixty feet high, with flowers in a spherical head.

GLO'SSY. *a.* (from *gloss.*) Shining; smoothly polished (*Dryden*).

GLOTTIS. (*glottis*, γλωττὶς from γλωττα, the tongue.) The superior opening of the larynx at the bottom of the tongue.

GLOTTIS, in music, the name applied by the ancients to an additional and moveable part of the flute, which they placed between their lips in performance, and which is supposed to be similar to our reed.

GLOUCESTER, a city of Gloucestershire, with two markets on Wednesday and Saturday. It is seated on the E. side of the Severn, where, by two streams, it makes the isle of Alney. It is a large and well-inhabited place, has been lately much improved, and its four principal streets are admired for the regularity of their junction in the centre of the town. It contains 12 churches, of which six only are in use, beside the cathedral of St. Peter, which is a handsome structure, remarkable for its large cloister and whispering gallery. Gloucester is a city and county of itself, and governed by a mayor, 12 aldermen, and 26 common-council, a town-clerk, and sword-bearer: the mayor is recorder of the city. It contains five hospitals, two free-schools, and a new county goal, and was fortified with a wall, which king Charles II, after the restoration, ordered to be demolished. It sends two members to parliament, and furnishes 1163 militiamen. It contains 1368 houses, and 7579 inhabitants. Great quantities of pins are made here. Lat. 51. 50 N. Lon. 2. 16 W.

GLOUCESTER (Robert of), the oldest of our English poets, lived in the time of Henry II. Camden quotes many of his old English rhymes, and speaks highly of him. He died about the beginning of the reign of king John, at an advanced age.

GLOUCESTERSHIRE, a county of England, is bounded on the west by Monmouthshire and Herefordshire, on the north by Worcestershire, on the east by Oxfordshire and Warwickshire, and on the south by Wiltshire and part of Somersetshire. It is sixty miles in length, twenty-six in breadth, and one hundred and sixty in circumference; containing 800,000 acres, 48,172 houses, 250,800 inhabitants, 290 parishes, 140 are impropriations, 1229 villages, two cities, and 28 market-towns. It sends only eight members to parliament: six for three towns, viz. Gloucester, Tewkesbury, and Cirencester, and two for the county. The soil and cultivation of Gloucestershire differ in different parts. On the Cotswold hills the soil is in general loamy, with stones; the earth shallow, seldom allowing the plow to enter more than four or five inches, beneath which is generally a kind of limestone. In some places the land is stiff and sour. About Fairford and Cirencester the soil is richer and deeper. The farms in general are large; great quantities of sheep are fed here, formerly celebrated for the fineness of their wool, and the smallness of their fleece. It is not improbable that the fine-woolled sheep of Spain might originally have been procured from Cotswold, sent over by Richard I, or Edward I. This breed of sheep has been changed for others of a larger kind, which produce a larger fleece of coarser wool. Here are many considerable dairy farms, and between the hills are some excellent meadows. What is called the vale of Berkeley is an extensive and fertile plain, lying on both sides of the Severn, in the south-west part of the county. This part of the county is celebrated for its excellent cheese. The vale about the city of Gloucester contains excellent meadow and pasture land. Towards Tewkesbury the soil is a sandy loam, rich and deep, chiefly employed in grazing and dairying. In the forest of Dean, it was formerly supposed the best ship-timber grew: this forest at present contains but a small part of what it did formerly; however, some pains are taken to preserve what remains. The woollen manufacture is carried on to a great extent in this county, particularly at Dursley, Stroud, Wotton-Underedge, Painswick, Minchin-Hampton, and their neighbourhood. Mines of coals abound in Kingswood and the neighbourhood of Bristol, and mines of iron in the forest of Dean. Great quantities of cider are made in the villages on the banks of the Severn, a kind of which, called Styre cider, is almost peculiar to the western banks of that river.

GLOVE, *chirotheca*, a habit or covering for the hand and wrist, used both for warmth, decency, and as a shelter from the weather. Gloves are distinguished, with respect to commerce, into leathern gloves, silk gloves, thread gloves, cotton gloves, worsted gloves, &c.

To throw the Glove was a practice or ceremony very usual among our forefathers, being the challenge whereby another was defied to single combat. It is still retained at the coronation of our kings, when the king's champion casts his glove in Westminster-hall. Favyn supposes the custom to have arisen from the eastern nations, who in all their sales and deliveries of lands, goods, &c. used to give the purchaser their glove by way of delivery or investiture. To this effect he quotes Ruth iv. 7. where the Chaldee paraphrase calls glove what the common version renders by shoe. He adds, that the rabbins interpret by glove, that passage in the cviiith Psalm, *In Idumeam extendam calceamentum meum*, Over Edom will I cast out my shoe. Accordingly, among us, he who took up the glove, declared thereby his acceptance of the challenge; and as part of the ceremony, continues Favyn, took the glove off his own right hand, and cast it upon the ground, to be taken up by the challenger.

To GLOVE. *v. a.* (from the noun.) To cover as with a glove (*Cleaveland*).

GLO'VER. *s.* (from *glove.*) One whose trade is to make or sell gloves (*Shakspeare*).

GLOVER (Richard), an English poet. He was also an eminent merchant in the city of London, and distinguished himself by a remarkable speech at the bar of the house of commons in 1739, just before the breaking out of the Spanish war. He was the author of Leonidas, and the tragedies of Boadicea and Medea. His Leonidas has been greatly admired, and was translated into French. He died in 1785, at the age of 74.

To GLOUT. *v. n.* To pout; to look sullen (*Chapman*).

To GLOW. *v. n.* (ȝlopan, Saxon.) 1. To be heated so as to shine without flame (*Hakewill*). 2. To burn with vehement heat (*Smith*). 3. To feel heat of body (*Addison*). 4. To exhibit a strong bright colour (*Milton*). 5. To feel passion of mind, or activity of fancy (*Prior*). 6. To rage or burn as a passion (*Shadwell*).

To GLOW. *v. a.* To make hot so as to shine: not in use (*Shakspeare*).

GLOW. *s.* (from the verb.) 1. Shining heat. 2. Vehemence of passion. 3. Brightness or vividness of colour (*Shakspeare*).

GLOW-WORM, in entomology. See LAMPYRIS.

GLOXI'NIA. In botany, a genus of the class didynamia, order angiospermia. Calyx superior, five-leaved; corol campanulate, with the border oblique; rudiment of a fifth filament inserted into the receptacle. One species only; a native herbaceous plant of Carthagena, with axillary one-flowered peduncles; and a corol pubescent outwardly.

To GLOZE. *v. n.* (ȝleṗan, Saxon.) 1. To flatter; to wheedle; to insinuate; to fawn (*South*). 2. To comment; to gloss (*Shaks.*).

GLOZE. *s.* (from the verb.) 1. Flattery; insinuation (*Shakspeare*). 2. Specious show; gloss: not used (*Sidney*).

GLUCINA, or GLUCINE. See GLYCINA.

GLUCKSTADT, a strong town of Saxony, in Germany. Lat. 53. 53 N. Lon. 9. 15 E.

GLUE, among artificers, a tenacious viscid matter, which serves as a cement to bind or connect things together. See GELATINE.

GLUE, *method of preparing and using*. Set a quart of water on the fire, then put in about half a pound of good glue, and boil them gently together till the glue be entirely dissolved, and of a due consistence. When glue is to be used, it must be made thoroughly hot; after which, with a brush dipped in it, besmear the faces of the joints as quick as possible; then clapping them together, slide or rub them lengthwise one upon another, two or three times, to settle them close; and so let them stand till they are dry and firm.

GLUE (Parchment), is made by boiling gently shreds of parchment in water, in the proportion of one pound of the former to six quarts of the latter, till it be reduced to one quart. The fluid is then to be strained from the dregs, and afterwards boiled to the consistence of glue. Isinglass glue is made in the same way; but this is improved by dissolving the isinglass in alcohol, by means of a gentle heat. See CEMENTS and GELATINE.

To GLUE. *v. a.* (from the noun.) 1. To join with a viscous cement (*Ecclus*). 2. To hold together (*Newton*). 3. To join; to unite; to inviscate (*Tillotson*).

GLU'EBOILER. *s.* (*glue* and *boil.*) One whose trade is to make glue.

GLU'ER. *s.* (from *glue.*) One who cements with glue.

GLUM. *a.* (a low cant word.) Sullen; stubbornly grave (*Guardian.*)

GLUME. In botany. (from *glubo*, denudo, corticem detraho, to bark, or take the bark from a tree; from the Greek γλυφω, to scrape or carve.) *Calyx graminis, valvis amplexantibus.* The calyx or corol of corn and grasses, formed of valves embracing the seed. It is thus explained by Varro (de R. R. I. c. 48): "Spica; in ordeo & tritico tria habet continentia, *granum, glumam, aristam.* Gluma est folliculus ejus. Arista & granum omnibus fere notum: gluma paucis. Videtur vocabulum etymon habere a glubendo, quòd eo folliculo deglubitur granum." In common language it is called the husk or chaff.

GLUMOUS. In botany, a term applied to the flower. A glumous or glumose flower is a kind of aggregate flower, having a filiform receptacle, with a common glume at the base. As in corn and grasses, *scirpus, cyperus, carex.*

To GLUT. *v. a.* (*engloutir*, Fr. *glutio*, Lat.) 1. To swallow; to devour (*Milton*). 2. To cloy; to fill beyond sufficiency (*Bacon*). 3. To feast or delight even to satiety (*Dryden*). 4. To overfill; to load (*Arbuthnot*). 5. To saturate (*Boyle*).

GLUT. *s.* (from the verb.) 1. That which is gorged or swallowed (*Milton*). 2. Plenty even to loathing and satiety (*Milton*). 3. More than enough; overmuch (*B. Jonson*). 4. Any thing that fills up a passage (*Woodw.*).

GLUTA. In botany, a genus of the class pentandria, order monogynia. Calyx campanulate, deciduous; petals five, agglutinated at the bottom to the column of the germ; filaments inserted into the tip of the column; germ pedicelled. One species: a native tree of Java, with alternate, sessile, lanceolate leaves; terminal panicle; stamens inserted at the base of the germ.

GLUTE'AL ARTERY, a branch of the internal iliac artery.

GLUTEN (Animal). See the article FIBRIN.

GLUTEN (Vegetable). A substance very closely resembling animal gluten in all the essential chemical properties, is found in several vegetables, and hence it has received the name of vegetable gluten.

Wheat flour was first found by Beccari to contain it in considerable quantity, and it is from this source that it is usually obtained for experiment by the following simple and easy process. Moisten any quantity of wheat flour with a little water, and knead it with the hand into a tough ductile paste; then let a

very slender stream of water keep dropping on the paste while it is incessantly worked about with the hands, and the water will run off white and turbid, owing to the fecula or starch which it carries off. The paste in the mean time gradually becomes more of a grey and almost demi-transparent appearance, and when the water runs off quite clear, nothing is left in the hands but pure gluten. No other precaution is required in this preparation but that of not drenching the flour at first with water, but only using a very small quantity with much kneading, that the gluten may not be carried off along with the starch. Good wheat flour will yield in this way about a fourth of its weight of gluten, and no other flour but that of wheat will yield it except in a very small proportion; and hence probably the peculiar property of wheat flour to make bread without any other addition than a ferment. See the article BREAD.

Gluten thus prepared is soft, extremely tenacious and elastic, so as to bear being extended considerably without pulling in pieces, and returning to its former dimensions. It is also considerably adhesive, readily sticking to the fingers. Its colour is a dirty grey; it has a faint and peculiar smell. It readily dries into a brittle semi-transparent substance, which looks not unlike glue, and in drying, it strongly adheres to the substance on which it rests: so that advantage is taken of this property to cement together broken pieces of china and other rough surfaces.

Gluten is absolutely insoluble in water, though it must owe its adhesiveness and ductility to the water which it absorbs when the flour is first wetted. Boiled with water it only becomes denser, and loses part of its adhesiveness. All the acids, vegetable as well as mineral, the latter being diluted, dissolve it without difficulty, forming a clear solution, from which it is again separated by alkalies. Strong sulphuric acid blackens and carbonizes it, and disengages from it an inflammable gass, and converts it partly to acetous acid, partly to ammonia. Concentrated nitric acid when cold disengages azotic gass from it, when hot it converts it chiefly into malic and oxalic acids, with evolution of much nitrous gass and ammonia. The alkalies also dissolve gluten with ease. When gradually heated without addition, it dries thoroughly, then shrinks and coils up like most other of the soft animal substances, then melts and takes fire, burning with the fetid odour of animal matter.

In close vessels it yields some ammoniacal water, and a very brown fetid thick oil in abundance, together with crystallized carbonat of ammonia and carburretted hydroden.

In short, it exhibits to chemical analysis all the properties of animal matter.

Gluten, when dry and kept so, remains unaltered for any length of time; but if kept constantly moist in the state in which it was first procured, it slowly alters, loses much of its tenacity, becomes fetid and covered with a thick white down, and falls into putrefaction. This process, however, is slow, and at the same time a sour smell is perceivable, and an acid is generated which probably corrects and retards the putrefaction. In this circumstance it is that it chiefly differs from animal gluten. M. Cadet has found that gluten, after having been kept for many days moist and mouldy, is partially soluble in alcohol. Some of this gluten was rubbed up with alcohol, and passed to the state of a thick turbid sirup; on adding more of the spirit, much of the gluten separated in its original form; but a part remained in perfect solution. This latter being diluted with water immediately became milky, and let fall a copious white precipitate which appeared like a fecula; but was gluten in intimate division. Another part of the alcoholic solution, being gently evaporated, left behind a dry, brittle, yellowish, glossy gluten, appearing like a varnish, and which the author of the experiment proposes to be used for this purpose, either by itself or as a vehicle for colours of different kinds.

Gluten is contained in small quantity in several vegetable juices and other parts, and may be separated from them with care: though in none is it so abundant as in wheat flour. Birdlime, a singular substance, extracted from the bark of the holly and also from the misletoe, is supposed to be chiefly gluten; and the green fecula of plants also appears to be composed very largely of this substance, as mentioned under that article.

GLUTEUS MAXIMUS. In anatomy. (*Gluteus*, from γλουτος, the buttocks.) *Gluteus magnus* of Albinus. *Glutæus major* of Cowper. This broad radiated muscle, which is divided into a number of strong fasciculi, is covered by a pretty thick aponeurosis derived from the *fascia lata*, and is situated immediately under the integuments. It arises fleshy from the outer lip of somewhat more than the posterior half of the spine of the ilium, from the ligaments that cover the two posterior spinous processes; from the posterior sacro-ischiatic ligament; and from the outer sides of the os sacrum and os coccygis. From these origins the fibres of the muscle run towards the great trochanter of the os femoris, where they form a broad and thick tendon, between which and the trochanter there is a considerable *bursa mucosa*. This tendon is inserted into the upper part of the *linea aspera*, for the space of two or three inches downwards; and sends off fibres to the fascia lata, and to the upper extremity of the vastus externus. This muscle serves to extend the thigh, by pulling it directly backwards; at the same time it draws it a little outwards, and thus assists in its rotatory motion. Its origin from the coccyx seems to prevent that bone from being forced too far backwards.

GLUTEUS MEDIUS. The posterior half of this muscle is covered by the gluteus maximus, which it greatly resembles in shape; but the anterior and upper part of it is covered

only by the integuments, and by a tendinous membrane which belongs to the fascia lata. It arises fleshy from the outer lip of the anterior part of the spine of the ilium, from part of the posterior surface of that bone, and likewise from the fascia that covers it. From these origins its fibres run towards the great trochanter, into the outer and posterior part of which it is inserted by a broad tendon. Between this tendon and the trochanter there is a small thin *bursa mucosa*. The uses of this muscle are nearly the same as those of the gluteus maximus; but it is not confined like that muscle, to rolling the os femoris outwards, its anterior portion being capable of turning that bone a little inwards. As it has no origin from the coccyx, it can have no effect on that bone.

GLUTEUS MINIMUS. *Glutæus minor* of Albinus. This, which is likewise a radiated muscle, is situated under the gluteus medius. In adults, and especially in old subjects, its outer surface is usually tendinous. It arises fleshy between the two semicircular ridges we observe on the outer surface of the ilium, and likewise from the edge of its great niche. Its fibres run in different directions towards a thick flat tendon, which adheres to the capsular ligament of the joint, and is inserted into the fore and upper part of the great trochanter. A small *bursa mucosa* may be observed between the tendon of this muscle and the trochanter. This muscle assists the two former in drawing the thigh backwards and outwards, and in rolling it. It may likewise serve to prevent the capsular ligament from being pinched in the motions of the joint.

GLU'TINOUS. *a.* (*glutineux*, French.) Gluy; viscous; tenacious (*Bacon*).

GLUTINOUS LEAF. In botany. Humore lubrico illitum. Besmeared with slippery moisture.

GLU'TINOUSNESS. *s.* (from *glutinous*.) Viscosity; tenacity (*Cheyne*).

GLU'TTON. *s.* (*glouton*, French.) 1. One who indulges himself too much in eating (*Prior*). 2. One eager of any thing to excess (*Cowley*).

GLUTTON, in mastiology. See URSUS.

To GLU'TTONISE. *v. n.* (from *glutton*.) To play the glutton; to be luxurious.

GLU'TTONOUS. *a.* (from *glutton*.) Given to excessive feeding (*Raleigh*).

GLU'TTONOUSLY. *ad.* With the voracity of a glutton.

GLU'TTONY, a voracity of appetite, or a propensity to gormandizing. A morbid sort of gluttony has been supposed to exist, called *fames canina*, "dog-like appetite," which sometimes occurs, and renders the person seized with it an object of cure as in other diseases. See BULIMY. But professed habitual gluttons may be reckoned amongst the monsters of nature, and for this reason king James I. was not greatly in the wrong when he asked a man who was presented to him that could eat a whole sheep at one meal, "What he could do more than another man?" and being answered, "He could not do so much," said, "Hang him then; for it is unfit a man should live that eats as much as twenty men, and cannot do so much as one."

The emperor Clodius Albinus would devour more apples at once than a bushel would hold. He would eat 500 figs to his breakfast, 100 peaches, 10 melons, 20 pound weight of grapes, 100 gnat-snappers, and 400 oysters. "Fye upon him (saith Lipsius,) God keep such a curse from the earth"

One of our Danish kings named Hardiknute was so great a glutton, that a historian calls him Bacca de Porco, "Swine's-mouth." His tables were covered four times a day with the most costly viands that either the air, sea, or land, could furnish: and as he lived he died; for, revelling and carousing at a wedding banquet at Lambeth, he fell down dead. His death was so welcome to his subjects, that they celebrated the day with sports and pastimes, calling it Hock-tide, which signifies scorn and contempt. With this king ended the reign of the Danes in England. One Phagon, under the reign of the emperor Aurelianus, at one meal ate a whole boar, 100 loaves of bread, a sheep, a pig, and drank above three gallons of wine.

We are told by Fuller, that one Nicholas Wood, of Harrison in Kent, ate a whole sheep of 16s. price at one meal, raw; at another time, 30 dozen of pigeons. At Sir William Sidley's, in the same county, he ate as much victuals as would have sufficed 30 men. At Lord Wotton's mansion-house in Kent, he devoured at one dinner 84 rabbits; which, by computation at half a rabbit a man, would have served 168 men. He ate to his breakfast 18 yards of black pudding. He devoured a whole hog at one sitting down; and after it, being accommodated with fruit, he ate three pecks of damsons!!

GLUY. *a.* (from *glue*.) Viscous; tenacious; glutinous (*Addison*).

GLYCINA, GLYCINE, or GLUCINE, as it is sometimes but improperly called: (from γλυκυς, *sweet*, on account of the high saccharine taste by which its salts are distinguished.) In chemistry, one of the five proper and unalkaline earths. See the article EARTH. In mineralogy it ranks under the order silicious. White, and somewhat unctuous to the touch, adheres strongly to the tongue when reduced to powder, is insipid and inodorous: produces no change on vegetable colours: does not contract in its dimensions by heat, and is not fusible; but with the assistance of borax runs into a clear transparent glass: specific gravity 29. 6: is not soluble in water, but when moistened with this fluid it forms a somewhat ductile paste. It combines with sulphuretted hydrogen through the medium of water: is soluble in the liquid fixed alkalis, resembling, in this respect, alumine: insoluble in ammonia; but dissolves readily in carbonated ammonia as yttria does: unites with the acids forming saline compounds, all

the soluble ones of which have a remarkably sweet subastringent taste.

It is a true earth of beryl and emerald: and was first detected in the former in 1798, by Vauquelin, who analyzed it at the request of Haüy, to determine whether it were formed of the same ingredients as the emerald, as Haüy had conjectured from mineralogical considerations. The result was the discovery of this earth in both, and consequently a confirmation of the suspicions of Haüy. The experiments of Vauquelin have since been repeated by Klaproth with equal success.

In order to procure glycine in a perfectly pure state, take any quantity of beryl or emerald, and having reduced it to a very fine powder, mix it with about three times its weight of caustic potash in a liquid form, and digest it to dryness in a silver crucible, after which let it be moderately ignited for about half an hour: the resulting mass will be found to be entirely soluble in a slight excess of muriatic acid; and the solution, after being evaporated to dryness, and then diffused in water, will deposit nearly the whole of the silex. The muriatic solution is now to be supersaturated with muriatic acid, and afterwards mixed at a boiling temperature with carbonat of soda, deposits the whole of its earthy contents in the form of a white soft precipitate: this, when well washed in water, is to be dissolved in sulphuric acid, and the solution being transferred to a ground stoppered bottle, is to be considerably supersaturated with carbonat of ammonia: both the alumine and glycine will be at first precipitated, but this last, by the assistance of occasional agitation, will be redissolved in the course of a few hours. The clear liquor being poured off, the earthy residue is to be again dissolved in sulphuric acid, and sulphat of potash being added, a copious deposit of crystals of alum will take place: the mother liquor and washings of the crystals being again treated with a large excess of carbonated ammonia, the remaining portions of glycine will be extracted, and the two ammoniacal solutions are to be added together. This fluid, when boiled in a retort, will deposit the whole of the glycine in the state of a white powder, and combined with carbonic acid: after being washed and dried it must be ignited, by which it will lose carbonic acid and moisture to the amount of about half its weight, and the residue is pure glycine.

Glycine (Carbonat of), may be prepared either by precipitating sulphat of glycine by either of the carbonated fixed alkalies, or simply by heating the solution of glycine in carbonated ammonia: a white impalpable powder falls down, which is carbonat of glycine.

This salt, according to Klaproth, consists of

Glycine - - - - -	53
Carbonic acid and water -	47
	100

It is decomposable by a low red heat, the acid and moisture being driven off: it is also decomposable with effervescence by other acids.

Glycine (Phosphat of), is obtained by adding phosphat of soda to sulphat, nitrat, or muriat of glycine: a white pulverulent precipitate falls down, which is the salt in question. When perfectly neutralized, it is uncrystallizable, insoluble in water, and insipid: at a high heat it melts into a transparent glass: when the acid is in excess, it is soluble in water. It is decomposable by the alkaline carbonat and alkaline earths, except carbonat of magnesia, and by the sulphat, nitrat, and muriat of alumine.

Glycine (Sulphat of), is procured by adding either pure or carbonated glycine to sulphuric acid, till this last is perfectly saturated: by spontaneous crystallization, sulphat of glycine is deposited in octohedrons, composed of two oblique four-sided pyramids, joined base to base, with the edges and solid angles truncated. The taste of this salt is very sweet, and somewhat astringent: it is readily soluble in water, and tincture of galls added to the solution occasions a yellowish white precipitate. The solid salt, when heated, dissolves in its water of crystallization, and afterwards becomes pulverulent: at a red heat the acid is entirely driven off, the pure earth being left behind.

If a little sulphat of potash is added to a solution of sulphated glycine, and the liquor is slowly evaporated, a quantity of small crystalline grains are deposited, which are readily soluble in seven or eight times their weight of cold water. If carbonated glycine is digested in a solution of common alum, the glycine is taken up, and the alumine entirely precipitated.

Glycine (Nitrat of), is prepared in the same manner as the preceding salt, by substituting the nitric for the sulphuric acid. Its taste is sweet and astringent, it is strongly deliquescent, and when evaporated assumes the consistence of honey, but does not crystallize: like the preceding salts, it is decomposable by a red heat, the acid being evaporated. With tincture of galls it gives a yellowish brown precipitate.

Glycine (Muriat of), both in the mode of its preparation, and in its general character, bears a close resemblance to the preceding; it is, however, capable of being crystallized, which is not the case with nitrat of glycine. Neither the pure earth nor any of its salts have been applied to any use.

Gly'cine. Wild liquorice. In botany, a genus of the class diadelphia, order decandria. Calyx two-lipped; keel of the corol turning back the banner at the tip. Forty-five species: natives of South America, the Cape, and India. They are all of the vetch or kidney bean tribe, and many of them, by some botanists, are made species of the phaseolus, but erroneously. The plant most cultivated in our gardens is G. frutescens, or Carolina bean as it is called, with bracted racemes, twining, shrubby stem, and blue flowers. See Nat. Hist. Pl. CXXIII.

GLYCY'PICROS. (γλυκυπικρος from γλυκυς,

sweet, and πικρος, bitter, so called from its bitterish sweet taste). The woody nightshade. See DULCAMARA.

GLYCYRRHIZA. Liquorice. Calyx two-lipped; the upper lip three-parted; lower undivided; legume ovale, compressed. Six species; of which the following are chiefly worthy of notice:

1. G. echinata. Prickly-podded liquorice. Legumes prickly; flowers in heads; stipules lanceolate; leaflets glabrous, oblong, mucronate.

2. G. glabra. Smooth-podded or common liquorice. Legumes glabrous; flowers racemed; stipuleless; leaflets ovate, somewhat retuse, a little glutinous underneath.

3. G. hirsuta. Hairy-podded liquorice. Legumes hairy; leaflets oblong lanceolate; flowers racemed.

The first species grows naturally in Apulia and Tartary; the second in Franconia, France, and Spain; and is commonly cultivated in England, for its use in medicine. It flowers in July, but the seeds do not ripen in this country. The third species grows naturally in the Levant; the first and third are preserved in botanic gardens only for the sake of variety: these flower at the same time with the second species, and in warm seasons ripen their seeds in England; they are all propagated in the same manner. The common liquorice is propagated in many parts of England to very great advantage. It delights in a rich sandy soil, which should be three feet deep at least; for the chief advantage consists in the length of the roots. The greatest quantities of it propagated in England are about Pontefract in Yorkshire, and Godalmin in Surry. The ground designed for liquorice must be well dug, and dunged the year before, that the dung may be thoroughly rotted in it; and just before it is planted, the earth is to be dug three spades deep, and laid very light. The plants to be set should be taken from the sides or heads of the old roots, and each must have a very good bud, or eye, otherwise they are very subject to miscarry; they should also be about ten inches long, and perfectly sound. The best season for planting them is the end of February, or the beginning of March, and this must be done in the following manner. The rows must be marked by a line drawn across the bed, at two feet distance, and the plants must be set in these by making a hole of their full depth, and something more, that the eye of the root may be an inch below the surface: they must also be set at two feet distance from each other in each row. The ground may then be sown over with onions, which, not rooting deep, will do the liquorice no injury for the first year. In October, when the stalks of the liquorice are dead, a little very rotten dung should be spread over the surface of the ground. Three years after the time of planting, the liquorice will be fit to take up for use; and this should be done just when the stalks are dead off; for if taken up sooner, the roots are very apt to shrink greatly in their weight. The roots about London look browner than those which have been propagated in a less rich soil, but then they are much larger, and grow quicker to their size.

The root of all these, but especially of G. glabra, contains a great quantity of saccharine matter, joined with some proportion of mucilage; and hence it has a sweet viscid taste. This last root is, on this account, in common use as a pectoral, or emollient, in catarrhal defluctions on the breast, coughs, hoarsenesses, &c. Infusions, or the extract from it, which is called Spanish juice, afford likewise very commodious vehicles for the exhibition of other medicines: the liquorice taste concealing that of unpalatable drugs more effectually than syrups, or any of the sweets of the saccharine kind.

GLYN. *s.* (Irish.) A hollow between two mountains; a glen (*Spenser*).

GLYPHE, in sculpture and architecture, denotes any canal or cavity used as an ornament.

GMELIN (Samuel Gottlieb), a man eminent for his knowledge of natural history, was the son of a physician at Tubingen, and was born in 1745. He passed great part of his life in travelling, and died in Tartary. He wrote a work, entitled, Travels in Russia, which was published at Petersburgh, in the German language, in 4 vols. 4to.

GMELI'NA. In botany, a genus of the class didynamia, order angiospermia. Calyx slightly four-toothed; corol four-cleft, campanulate; anthers, two of them two-parted, the other two simple; drupe with a two-celled nut. One species, an Asiatic tree with round stiff branches; leaves opposite ovate downy underneath; flowers racemed, terminal. There is a variety which consists of a much smaller plant.

GNAPHA'LIUM. Everlasting goldy-locks. Cudweed. In botany, a genus of the class syngenesia, order polygamia superflua. Receptacle naked; down feathery or rough; calyx imbricate with the marginal scales rounded, scarious and coloured; florets of the margin subulate. A hundred and forty-six species scattered over the globe, but by far the greater number Cape plants; and nine indigenous to the pastures, marshes, or mountains of our own country. They may be thus subdivided:

A. Shrubby; with white flowers.
B. Shrubby; with yellow flowers.
C. Herbaceous; with yellow flowers.
D. Herbaceous; with white flowers.
E. Filago-formed.
F. Of doubtful form, and insufficiently described.

The shrubby sorts admitted into gardens are generally propagated by slips, or cuttings, which may be planted in June or July, in a bed of light earth; and those that are natives of warm countries should be covered with glasses, or shaded with mats, observing to refresh them frequently with water, in gentle quantities. In four or five weeks, when these cuttings will have put out roots, they should

be taken up, and planted in pots filled with light earth, and placed in a shady situation till they have taken new root; then let them be removed into an open place, till about the middle or end of October; at which time they may be removed under a common frame; but in mild weather exposed to the open air. But such as are more hardy, and are natives of France, Germany, and other parts of Europe, will live in the open air in England: these may be propagated by slips or cuttings, which may be planted during any of the summer months, in a shady border, and in autumn transplanted to the places in which they are designed to remain. These sorts, for the most part, should have a dry undunged soil. The annuals are propagated by seeds, which, in general, should be sown upon a bed of light earth, where the plants are to continue: when they come up they should be thinned where they grow too close, and kept clean from weeds. Some sorts will arise from scattered seeds better than when they are sown by art. The mountain gnafalium, called also catsfoot, grows naturally in the mountains of England, and other countries in Europe, and is a perennial plant, propagated by off-sets, which should be planted in autumn, in a shady situation, where they will require no other care than to keep them clean from weeds. There is one variety of African goldylocks, with an oblong narrow leaf, and a reddish flower, which is afterwards yellow, that may be propagated in the same manner; as may also be several others from the same part of the world. Virginia goldylocks, with a plaintain leaf, is sometimes propagated by seeds; but the plants multiply so fast by off-sets, that the seeds are little regarded: this sort will thrive in the open air, if planted in a warm soil, and a dry situation. Blunt-leafed goldylocks, with silvery heads growing in clusters, is also a native of North America; and is propagated by seeds; from which, if permitted to be scattered, the plants will come up annually, without any other care than that of keeping them clean from weeds.

G. stœchas, with linear, corymb-compound leaves, wand-like branches, and yellow flowers, generally appearing in May or June, was formerly admitted into the pharmacopœias, under the name of ELICHRYSUM; which see.

To GNAR. *To* GNARL. *v. n.* (gnyrran, Saxon.) To growl; to murmur; to snarl (*Spenser*).

GNA'RLED. *a.* Knotty (*Shakspeare*).

To GNASH. *v. a.* (*knaschen*, Dutch.) To strike together; to clash (*Dryden*).

To GNASH. *v. n.* 1. To grind or collide the teeth (*Matthew*). 2. To rage even to collision of the teeth; to fume; to growl (*Dryden*).

GNAT, in entomology. See CULEX.

GNA'TFLOWER. *s.* (*gnat* and *flower.*) The beeflower.

GNA'TSNAPPER. *s.* (*gnat* and *snap.*) A bird that lives by catching gnats (*Hakewill.*)

To GNAW. *v. a.* (gnagan, Saxon.) 1. To eat by degrees; to devour by slow corrosion (*Dryden*). 2. To bite in agony or rage (*Shakspeare*). 3. To wear away by biting (*Sandys*). 4. To fret; to waste; to corrode. 5. To pick with the teeth (*Dryden*).

To GNAW. *v. n.* To exercise the teeth (*Shakspeare*).

GNAWED, in botany. See ERODED.

GNA'WER. *s.* (from *gnaw.*) One that gnaws.

GNEISSUM. GNEISS. In mineralogy, a genus of the class earths, order aggregate. Composed of parts cohering together without any intermediate cement; often in the form of crystals, and sometimes alternating in layers, of a slaty, occasionally a fibrous texture, forming plates laid on each other; found in primitive mountains, generally resting upon beds of granite; hard, not melting before the blow-pipe, nor mouldering in the air. Thirty-one species; confined to Europe; chiefly found in Germany, and the adjoining countries, especially the Carpathian mountains; and in the neighbourhood of Vesuvius.

The following are the chief:

1. G. fornacum. Micaceous slate. Consisting of the greater part quartz and mica. Found in most mountainous countries of Europe, in innumerable varieties of proportion, combination, distribution, colour, and hardness; and is chiefly covered with argillaceous slate, sand, and limestone. It is formed of distinct plates laid on each other, and separated by thin layers of mica; and is generally rich in metallic ores: it is used for laying the beds of large furnaces.

2. G. micaceum. Micaceous schistus, consisting of the greater part mica and quartz. Found in Norway; forming entire mountains of a silvery colour and splendour: the plates of mica are extremely thin and closely compacted together, so as to form distinct tables; the quartz is generally disposed in small veins, granulations, or larger strata.

3. G. alpinum. Consisting of quartz, mica, and garnets. Found in most of the higher Alpine mountains; the mica chiefly silvery, sometimes predominant, sometimes very equally distributed, sometimes hardly visible; the garnets are more commonly red than brown, sometimes of a common form and considerable size; sometimes crystallized and less: sometimes there is found with the gneiss a portion of schorl, talc, or feldspar: when the quartz is in greater proportion it is made into millstones.

GNESNA, an episcopal town of Poland, 90 miles N. by E. of Breslau. Lat. 52. 28 N. Lon. 17. 40 E.

GNETUM. In botany, a genus of the class monœcia, order monadelphia. Male: calyx a minute coloured scale of the ament; corolless; filament one, with two anthers. Fem. calyx a lacerated scale of the ament; corolless; style with a cloven stigma; drupe one-seeded. One species: an East Indian herb.

GNI'DIA. In botany, a genus of the class octandria, order monogynia. Calyx funnel-form, four-cleft; petals four, inserted on the calyx; nut somewhat drupaceous. Sixteen

species: all Cape plants, except G. daphnæfolia, with ten stamens and five-cleft terminal flowers, which is a native of Madagascar.

GNOMES, Gnomi, certain imaginary beings who, according to the cabbalists, inhabit the inner parts of the earth. They are supposed small in stature, and the guardians of mines, &c.

Gnome, is also sometimes used for a pithy and sententious observation.

GNOMON, in astronomy, is an instrument or apparatus for measuring the altitudes, declinations, &c. of the sun and stars. The gnomon is usually a pillar, or column, or pyramid, erected upon level ground, or a pavement. For making the more considerable observations, both the ancients and moderns have made great use of it, especially the former; and many have preferred it to the smaller quadrants, both as more accurate, easier made, and more easily applied.

The most ancient observation of this kind extant, is that made by Pytheas, in the time of Alexander the Great, at Marseilles, where he found the height of the gnomon was in proportion to the meridian shadow at the summer solstice, as 213½ to 600; just the same as Gassendi found it to be, by an observation made at the same place, almost 2000 years after, viz. in the year 1636. Ricciol. Almag. vol. i. lib. 3, cap. 14.

The elevation of the pole may be found by means of the gnomon, by finding the meridian height of the sun; for, this being given, we have the elevation of the equator, and consequently that of the pole. The meridian height of the sun may be found in the following manner: Let AC, fig. 5, Pl. 76, be the gnomon, AB the shadow, and CB part of a ray drawn from the centre of the sun, passing by the top of the gnomon, and terminating the shadow at B. These three lines form a right-angled triangle BAC, whereof the two legs AB and AC are given, the number of feet and inches in them being found by actual mensuration. Hence the acute angles may be found in the following manner: Let one leg be radius, and the other will be tangent of the opposite angle. Thus, if we make AB radius, AC will be tangent of the opposite angle ABC. This tangent is found by the golden rule—as the number of feet, inches, &c. in AB, is to the number of feet, inches, &c. in AC; so is the radius to a fourth number, which is the tangent required. This fourth number looked for in the table of tangents gives the measure of the angle ABC, which is the meridian height of the sun required.

This method of observation, however, is by no means accurate; and Ricciolus takes notice of the following deficiencies in the ancient observations made in this manner: 1. They did not take into account the sun's parallax, which makes his apparent altitude less than it would be if the gnomon were placed at the centre of the earth. 2. They neglected refraction, by which the apparent height of the sun is somewhat increased. 3. They made their calculations as if the shadows were terminated by a ray coming from the sun's centre; whereas it is bounded by one coming from the upper edge of his limb. These errors, however, may be easily allowed for; and, when this has been done, the ancient observations are generally found to coincide nearly with those of the moderns.

Some gnomons show the altitude of the sun not by the shadow, but by a hole in the top made in a plate of metal inserted there, through which the rays fall upon a level pavement. In gnomons of this kind the centre of the instrument is always exactly under the hole in the metal plate; and the method of finding the height of the sun is the same as that already described. A gnomon of this kind was made in the year 1576 by Egnatio Dante, in the church of St. Petronia at Bologna. Near the top of the south wall of the church he placed a brass plate about three-eighths of an inch thick, in which was cut a circular hole almost an inch in diameter. The plate was set in the wall at an angle of about 45½ deg. the height of the equator in that place. The height of the hole in the plate from the ground is near 66 feet, and the length of the line drawn upon the pavement is 169 feet. This line, however, is not exactly in the meridian, but as near it as the pillars of the church would admit; and on it the rays of the sun, passing through the hole, formed an ellipsis at different distances from the wall, according to the season of the year. Another gnomon of this kind was made in the same church by D. Cassini, in 1655.

Gnomon, in dialling, is the style, pin, or cock of a dial, the shadow of which points out the hours. This is always supposed to represent the axis of the world, to which it is therefore parallel, or coincident, the two ends of it pointing straight to the north and south poles of the world.

GNOMONICA, or Gnomonics. See Dialling.

GNOSSIS and Gnossia, an epithet given to Ariadne, because she lived or was born at Gnossus. The crown which she received from Bacchus, and which was made a constellation, is called Gnossia Stella.

GNOSTICS, an ancient sect of Christians, celebrated from the first rise of Christianity, especially in the East.

It appears from several passages of the sacred writings, particularly 1 John ii. 18. 1 Tim. vi. 20. and Col. ii. 8. that many persons were infected with the gnostic opinions in the first century; though the sect did not render itself conspicuous, either for number or reputation, before the time of Adrian, when some writers erroneously date its rise.

The word is formed of the Latin *gnosticus*, and that of the Greek γνωστικος, *knowing*, of γινωσκω, *I know*.

The name Gnostic was adopted by those of this sect, as if they were the only persons who had the true knowledge of Christianity: just as the term Rational Christians is assumed by some modern Arians, and we believe all So-

cinians; as the most modest way of insinuating that no other Christians are rational or men of real knowledge but themselves. Accordingly, they looked on all other Christians as simple, ignorant, and barbarous persons, who explained and interpreted the sacred writings in a too low, literal, and unedifying signification.

At first, the Gnostics were only the philosophers and wits of those times, who formed themselves a peculiar system of theology, agreeable to the philosophy of Pythagoras and Plato; to which they accommodated all their interpretations of scripture. But

GNOSTICS afterwards became a generical name, comprehending divers sects and parties of heretics, who rose in the first centuries, and who, though they differed among themselves as to circumstances, yet all agreed in some common principles. They were such as corrupted the doctrine of the gospel by a profane mixture of the tenets of the oriental philosophy, concerning the origin of evil and the creation of the world, with its divine truths. Such were the Valentinians, Simonians, Carpocratians, Nicolaitans, &c.

GNOSTICS was sometimes also more particularly attributed to the successors of the first Nicolaitans and Carpocratians, in the second century, upon their laying aside the names of the first authors. Such as would be thoroughly acquainted with all their doctrines, reveries, and visions, may consult St. Irenæus, Tertullian, Clemens Alexandrinus, Origen, and St. Epiphanius; particularly the first of these writers, who relates their sentiments at large, and confutes them at the same time: indeed, he dwells more expressly on the Valentinians than any other sort of Gnostics; but he shews the general principles whereon all their mistaken opinions were founded, and the method they followed in explaining scripture. He accuses them with introducing into religion certain vain and ridiculous genealogies, i. e. a kind of divine processions or emanations, which had no other foundation but in their own wild imagination.

In effect, the Gnostics confessed, that these æons or emanations were no where expressly delivered in the sacred writings; but insisted at the same time, that Jesus Christ had intimated them in parables to such as could understand him. They built their theology not only on the gospels and the epistles of St. Paul, but also on the law of Moses and the prophets.

These last laws were peculiarly serviceable to them, on account of the allegories and allusions with which they abound; which are capable of different interpretations.

Though their doctrine, concerning the creation of the world by one or more inferior beings of an evil or imperfect nature, led them to deny the divine authority of the books of the Old Testament, which contradicted this idle fiction, and filled them with an abhorrence of Moses and the religion he taught; alleging, that he was actuated by the malignant author of this world, who consulted his own glory and authority, and not the real advantage of men. Their persuasion that evil resided in matter, as its centre and source, made them treat the body with contempt, discourage marriage, and reject the doctrine of the resurrection of the body and its re-union with the immortal spirit. Their notion, that malevolent genii presided in nature, and occasioned diseases and calamities, wars, and desolations, induced them to apply themselves to the study of magic, in order to weaken the powers or suspend the influence of these malignant agents.

The Gnostics considered Jesus Christ as the Son of God, and, consequently, inferior to the Father, who came into the world for the rescue and happiness of miserable mortals, oppressed by matter and evil beings: but they rejected our Lord's humanity, on the principle that every thing corporeal is essentially and intrinsically evil; and, therefore, the greatest part of them denied the reality of his sufferings. They set a great value on the beginning of the gospel of St. John, where they fancied they saw a great deal of their æons or emanations under the word, the life, the light, &c. They divided all nature into three kinds of beings, viz. *hylic*, or material; *psychic*, or animal; and *pneumatic*, or spiritual.

On the like principle they also distinguished three sorts of men; *material*, *animal*, and *spiritual*. The first, who were material, and incapable of knowledge, inevitably perished, both soul and body; the third, such as the Gnostics themselves pretended to be, were all certainly saved; the psychic, or animal, who were the middle between the other two, were capable either of being saved or damned, according to their good or evil actions. With regard to their moral doctrines and conduct, they were much divided.

GNU, in mastiology. See ANTILOPE.

To GO. *v. n.* pret. *I went*; *I have gone*. (gan, Saxon.) 1. To walk; to move step by step (*Shakspeare*). 2. To move, not stand still (*Matthew*). 3. To walk solemnly (*Hook.*). 4. To walk leisurely, not run (*Shakspeare*). 5. To travel; to journey (*Milton*). 6. To proceed; to make a progress (*Dryden*). 7. To remove from place to place (*Shakspeare*). 8. To depart from a place; to move from a place (*Cowley*). 9. To move or pass in any manner, or to any end (*Herbert*). 10. To pass in company with others (*Temple*). 11. To proceed in any course of life good or bad (*Ezekiel*). 12. To proceed in mental operation (*Digby*). 13. To take any road (*Deuteronomy*). 14. To march in a hostile or warlike manner (*Shakspeare*). 15. To change state or opinion for better or worse: *affairs* go *to ruin* (*Knolles*). 16. To apply one's self: *he went to his studies* (*Bentley*). 17. To have recourse to (*Corinthians*). 18. To be about to do; *I am going to live* (*Locke*). 19. To shift; to pass life not quite well: *I go forward as I can* (*Locke*). 20. To decline; to tend toward death or ruin; *we thought his credit* going (*Shakspeare*). 21.

To be in party or design (*Dryden*). 22. To escape (*Maccabees*). 23. To tend to any act (*Shakspeare*). 24. To be uttered (*Addison*). 25. To be talked of; to be known (*Addison*). 26. To pass; to be received (*Sidney*). 27. To move by mechanism (*Otway*). 28. To be in motion from whatever cause (*Shakspeare*). 29. To move in any direction (*Shakspeare*). 30. To flow; to pass; to have a course (*Dryden*). 31. To have any tendency (*Dryden*). 32. To be in a state of compact or partnership (*L'Estrange*). 33. To be regulated by any method; to proceed upon principles (*Sprat*). 34. To be pregnant: *women go commonly nine months* (*Bacon*). 35. To pass; not to remain (*Judges*). 36. To pass; not to be retained (*Shakspeare*). 37. To be expended (*Felton*). 38. To be in order of time or place: *this name* goes *first* (*Watts*). 39. To reach or be extended to any degree (*Locke*). 40. To extend to consequences (*L'Estrange*). 41. To reach by effects (*Wilkins*). 42. To extend in meaning (*Dryden*). 43. To spread; to be dispersed; to reach (*Tate*). 44. To have influence; to be of weight; to be of value (*Temple*). 45. To be rated one with another; to be considered with regard to greater or less worth (*Arbuthnot*). 46. To contribute; to conduce; to concur; to be an ingredient (*Collier*). 47. To fall out, or terminate; to succeed (*Shakspeare*). 48. To be in any state (*Chronicles*). 49. To proceed in train or consequence (*Shakspeare*). 50. *To* Go *about*. To attempt; to endeavour; to set one's self to any business (*Shakspeare*). 51. *To* Go *aside*. To err; to deviate from the right (*Numbers*). 52. *To* Go *between*. To interpose; to moderate between two (*Shakspeare*). 53. *To* Go *by*. To pass away unnoticed (*Shakspeare*). 54. *To* Go *by*. To find or get in the conclusion (*Milton*). 55. *To* Go *by*. To observe as a rule (*Sharp*). 56. *To* Go *down*. To be swallowed; to be received, not rejected (*Dryden*). 57. *To* Go *in and out*. To do the business of life (*Psalms*). 58. *To* Go *in and out*. To be at liberty (*John*). 59. *To* Go *off*. To die; to go out of life; to decease (*Tatler*). 60. *To* Go *off*. To depart from a post (*Shakspeare*). 61. *To* Go *on*. To make attack (*Ben Jonson*). 62. *To* Go *on*. To proceed (*Sidney*). 63. *To* Go *over*. To revolt; to betake himself to another party (*Swift*). 64. *To* Go *out*. To go upon an expedition (*Shakspeare*). 65. *To* Go *out*. To be extinguished (*Bacon*). 66. *To* Go *through*. To perform thoroughly; to execute (*Sidney*). 67. *To* Go *through*. To suffer; to undergo (*Arbuthnot*). 68. *To* Go *upon*. To take as a principle (*Addison*).

Go TO. *interject.* Come, come, take the right course. A scornful exhortation (*Spenser*).

GO-BETWEEN. *s.* (*go* and *between*.) One that transacts business by running between two parties (*Shakspeare*).

GO-BY. *s.* Delusion; artifice; circumvention; overreach (*Collier*).

GO-CART. *s.* (*go* and *cart*.) A machine in which children are inclosed to teach them to walk (*Prior*).

GOA, an island in the Indian sea, near the west coast of Hindustan, separated from the continent by a river called Mandova, which soon after runs into the sea; about eight leagues in circumference. The soil is fertile, especially in the valleys; the trees are always covered with leaves, flowers, and fruit; and abundance of springs issue from the mountains.

GOA, a considerable city of the peninsula of Hindustan, on the coast of Malabar; the capital of the Portuguese settlements in India, and the seat of a viceroy. It stands on the N. side of the small island of the same name, and has the conveniency of a fine river, capable of receiving ships of the greatest burden. This city contains a number of handsome churches and convents, with a stately hospital, and an elegant palace for the viceroy. The market-place takes up an acre of ground. The number of inhabitants is said to be, in all, about 20,000: of these the native Portuguese amount to a very small number; the Mestizos are more numerous: the Canarins, or natives, are as black as jet, but have long black hair, and many of them fine features; multitudes of negro slaves, and pagans of different nations, make up the rest of the people. It is generally agreed, that the men are for the most part proud, indolent, jealous, revengeful, and indigent; the women lazy, lascivious, and as well skilled in poisoning as any in the world: 215 miles S.S.E. Bombay. Lat. 15. 28 N. Lon. 73. 45 E.

GOAD. *s.* (ȝad, Saxon.) A pointed instrument with which oxen are driven forward (*Pope*).

To GOAD. *v. a.* (from the noun.) 1. To prick or drive with a goad. 2. To incite; to stimulate, to instigate (*Dryden*).

GOAL. See GAOL.

GOAL. *s.* (*gaule*, French.) 1. The landmark set up to bound a race; the point marked out to which racers run (*Milton*). 2. The starting-post (*Dryden*). 3. The final purpose; the end to which a design tends (*Pope*).

GOAR. *s.* (*goror*, Welsh.) Any edging sewed upon cloth to strengthen it.

GOAR (St.), a town of Germany, in the circle of Lower Rhine. It is seated under the stupendous rock and castle of Rheinfels; and has a brisk commerce in wines and hides. 15 miles S.E. of Coblentz.

GOAT, in mastiology. See CAPRA.

GOAT, in astronomy. See CAPRICORN.

GOAT'S BEARD, in botany. See TRAGOPOGON.

GOAT-SUCKER, in ornithology. See CAPRIMULGUS.

GOAT'S THORN, in botany. See ASTRAGALUS.

GOATISH. *a.* (from *goat*.) Resembling a goat in any quality: as, rankness; lust (*More*).

GOB. *s.* (*gobe*, French.) A small quantity.

GO'BBET. *s.* (*gobe*, French.) A mouthful; as much as can be swallowed at once (*Sandys*).

To Go'bbet. *v. a.* To swallow at a mouthful (*L'Estrange*).

To GO'BBLE. *v. a.* (*gober*, French.) To swallow hastily with tumult and noise (*Prior*).

GO'BBLER *s.* (from *gobble.*) One that devours in haste; a gormond; a greedy eater.

GOBBO (Pietro Paolo Cortonese), a very eminent painter of fruit and landscapes, was born at Cortona in 1580. His subjects are admirably relieved, touched with a free pencil, and charmingly coloured. He died in 1640.

GOBELIN (G les), a famous French dyer, in the reign of Francis I. discovered a method of dyeing a beautiful scarlet, and his name has been given ever since to the finest French scarlets. His house, in the suburb of St. Marcel at Paris, and the river he made use of, are still called the Gobelins. An academy for drawing, and a manufactory of fine tapestries, were erected in this quarter in 1666; for which reason the tapestries are called the Gobelins.

GOBIUS. Goby. In zoology, a genus of the class pisces, order thoracica. Head small; eyes approximate, with two punctures between them; gill-membrane four-rayed; body small, compressed on each side, covered with small scales, with a tubercle behind the vent; ventral fins united into a funnel-like oval: dorsal fins two. These lie chiefly under stones; feed on worms, insects, and the spawn and young fry of other fishes: they adhere firmly to rocks by the funnel-shaped ventral fins; mouth small; jaws armed with small sharp teeth; tongue short, obtuse; palate rough with four bones; aperture of the gills narrow, rounded; lateral line in the middle of the body. Twenty-five species; chiefly natives of European and Asiatic seas: a few of American. The following are the chief:

1 G. niger. Black or common goby. Second dorsal fin with fourteen rays. Inhabits the European and Asiatic seas; from five to six inches long; body deep-brown or whitish, with deep-brown and yellow spots; flesh very good.

2. G. jozo. Rays of the dorsal fins setaceous, reaching above the membrane: body above brown, beneath whitish, covered with scales. Inhabits the shores of the European and Mediterranean seas; from four to six inches long: flesh hardly eatable.

3. G. schlofferi. Blackish-brown, beneath whitish; rays of the first dorsal fin spinous: body a little compressed, and hardly decreasing towards the tail, covered with large, round, coriaceous scales. Inhabits the lakes of Amboina; very fat, and about a span long; when pursued by other fishes hides itself in the mud.

4. G. lanceolatus. Tail very long, sharp-pointed; body oblong, covered with round imbricate scales which are longer on the hind part; beneath cinereous; flesh good. Inhabits the rivers and brooks of Martinico. See Nat. Hist. Pl. CXIX.

5. G. ocellaris. Upper jaw longer; first dorsal fin six-rayed, with a black ocellate spot near the base on the hind part. Inhabits the fresh-river waters of Otaheite.

6. G. strigalus. Ventral fins divided; first dorsal fin six-rayed. Inhabits the Pacific Ocean near Otaheite.

7. G. Gronovii. Ventral fins divided; first dorsal fin ten-rayed; tail forked. Inhabits the South American seas; body silvery, above black, spotted with black at the sides, and covered with small imbricate scales.

GO'BLET. *s.* (*gobelet*, French.) A bowl, or cup, that holds a large draught (*Denham*).

GO'BLIN. *s.* (*gobeline*, French.) 1. An evil spirit; a walking spirit; a frightful phantom (*Locke*). 2. A fairy; an elf (*Shaks.*).

GOBY, in ichthyology. See Golius.

GOCH, a town of Cleves, in Germany, subject to the king of Prussia. Lat. 51. 39 N. Lon 5. 52 E.

GOD, *Deus*, the Supreme Being, the first cause or creator of the universe, and the only true object of religious worship. The Hebrews named him Jehovah; which name however they never pronounced, but used instead of it the words Adonai, or Elohim.

By his immateriality, intelligence, and freedom, God is distinguished from fate, nature, destiny, necessity, chance, anima mundi, and from all the other fictitious beings, acknowledged by the Stoics, Pantheists, Spinosists, and other sorts of atheists.

The knowledge of God, his nature, attributes, word, and works, with the relations between him and his creatures, make the subject of the extensive science called theology.

In Scripture, God is defined by, I am that I am, Alpha and Omega; the Beginning and End of all things.

Among philosophers, he is defined a being of infinite perfection; or in whom there is no defect of any thing which we conceive might raise, improve, or exalt his nature.

Among men, he is chiefly considered as the first cause, the first being, who has existed from the beginning, has created the world, or who subsists necessarily, or of himself.

Sir Isaac Newton chooses to consider and define God, not as is usually done, from his perfection, his nature, existence, or the like; but from his dominion. "The word God, according to him, is a relative term, and has a regard to servants; it is true, it denotes a being eternal, infinite, and absolutely perfect; but a being, however eternal, infinite, and absolutely perfect, without dominion, would not be God.

"The word God, the same author observes, frequently signifies Lord; but every lord is not God: it is the dominion of a spiritual being or lord, that constitutes God; true dominion, true God; supreme, the supreme; feigned, the false god.

"From such true dominion it follows, that the true God is living, intelligent, and powerful; and from his other perfections, that he is supreme, or supremely perfect: he is eternal and infinite; omnipotent and omniscient; that is, he endures from eternity to eternity, and is present from infinity to infinity.

"He governs all things that exist, and knows all things that are to be known: he is not eternity or infinity, but eternal and infinite: he is not duration or space, but he endures, and is present: he endures always, and is present every where; and by existing always, and every where, he constitutes the very thing, duration and space, eternity and infinity.

"Since every particle of space is always, and every indivisible moment of duration every where, the Creator and Lord of all things can never be *nunquam*, or *nusquam*.

"He is omnipresent, not only virtually, but also substantially; for power without substance cannot subsist. All things are contained, and move in him; but without any mutual passion: he suffers nothing from the motions of bodies; nor do they undergo any resistance from his omnipresence.

"It is confessed, that God exists necessarily; and by the same necessity he exists always, and every where. Hence, also, he must be perfectly similar; all eye, all ear, all brain, all arm, all the power of perceiving, understanding, and acting; but after a manner not at all corporeal, after a manner not like that of men, after a manner wholly to us unknown.

"He is destitute of all body, and all bodily shape; and therefore cannot be seen, heard, nor touched; nor ought to be worshipped under the representation of any thing corporeal.

"We have ideas of the attributes of God, but do not know the substance even of any thing: we see only the figures and colours of bodies, hear only sounds, touch only the outward surfaces, smell only odours, and taste tastes; and do not, cannot, by any sense, or any reflex act, know their inward substances; and much less can we have any notion of the substance of God.

"We know him by his properties and attributes: by the most wise and excellent structure of things, and by final causes; but we adore and worship him only on account of his dominion: for God, setting aside dominion, providence, and final causes, is nothing else but fate and nature." Newt. Philos. Nat. Princip. Math. in calce.

An ingenious divine has wrought these thoughts of that admirable philosopher into form, and ripened them into a more express system, in a discourse on this subject. Maxwell's Disc. concerning God.

The existence and principal attributes of the Supreme Being may be inferred very briefly from the following considerations:

We must either admit that impotence and ignorance produce power and knowledge, or that the latter are absolutely necessary in themselves. Now, so necessary are power and knowledge in nature, that if we deny their absolute and inconditionate necessity, we affirm their absolute impossibility, since there was nothing in nature to produce them. This is one of these instances where it is impossible for the most disingenuous sceptic to doubt with his utmost effort. They must likewise be infinite or unlimited, for they could not have limited themselves, or made themselves less perfections than they necessarily were. That necessary power and knowledge should lessen or limit themselves, is both morally and physically impossible; and there was nothing else in nature to limit or lessen them, for nature consisted of nothing else. Ignorance and impotence are still nothing. Add to this, that it is something positive that must be infinite; and nothing is of such a positive nature as such perfections, and those necessary. Infinite joined to a negation, that is, infinite nothing, is absurd. Infinite deadness, infinite weakness, infinite ignorance, makes the perfections which are thus infinitely denied, again impossible. Lastly, they must be undivided, as well as unlimited, for the same reasons, which it is almost needless to repeat. Division is limitation. It is their nature to be united. They could not have divided themselves. Infinite power, or infinite knowledge, could not have been divided, and thereby lessened itself. This is again both morally and physically impossible. And as there was nothing else in nature, they could not have been divided: we must still remember that their contraries are nothing, and could not make a part of nature.

But, as Mr. Maclaurin observes, the plain argument for the existence of the Deity, obvious to all, and carrying irresistible conviction with it, is from the evident contrivance and fitness of things for one another, which we meet with throughout all parts of the universe. There is no need of nice or subtle reasonings in this matter; a manifest contrivance immediately suggests a contriver. It strikes us like a sensation, and artful reasonings against it may puzzle us, but without shaking our belief. No person, for example, that knows the principles of optics and the structure of the eye can believe that it was formed without skill in that science, or that the ear was formed without the knowledge of sounds, or that the male and female, in animals, were not formed for each other, and for continuing the species. All our accounts of nature are full of instances of this kind. The admirable and beautiful structure of things for final causes, exalt our idea of the contriver: the unity of design shows him to be one. The great motions in the system, performed with the same facility as the least, suggest his almighty power, which gave motion to the earth and the celestial bodies with equal ease as to the minutest particles. The subtilty of the motions and actions in the internal parts of bodies, shows that his influence penetrates the inmost recesses of things, and that he is equally active and present every where. The simplicity of the laws that prevail in the world, the excellent disposition of things in order to obtain the best ends, and the beauty which adorns the works of nature, far superior to any thing in art, suggest his consummate wisdom. The usefulness of the whole scheme, so well contrived for the intelligent beings that enjoy it, with the internal disposition and moral structure of those beings themselves, show his

unbounded goodness. These are the arguments which are sufficiently open to the views and capacities of the unlearned; while, at the same time, they acquire new strength and lustre from the discoveries of the learned.

The Deity's acting and interposing in the universe show that he governs as well as formed it; and the depth of his counsels, even in conducting the material universe, of which a great part surpasses our knowledge, keep up an inward veneration and awe of this great being, and dispose us to receive what may be otherwise revealed to us concerning him. It has been justly observed that some of the laws of nature now known to us must have escaped us if we had wanted the sense of seeing. It may be in his power to bestow upon us other senses, of which we have at present no idea; without which it may be impossible for us to know all his works, or to have more adequate ideas of himself. In our present state we know enough to be satisfied of our dependency upon him, and of the duty we owe to him, the Lord and Disposer of all things. He is not the object of sense; his essence, and indeed that of all other substances, is beyond the reach of all our discoveries: but his attributes clearly appear in his admirable works. We know that the highest conceptions we are able to form of them are still beneath his real perfections: but his power and dominion over us, and our duty towards him, are manifest.

"Though God has given us no innate ideas of himself," says Mr. Locke, "yet having furnished us with those faculties our minds are endowed with, he hath not left himself without a witness: since we have sense, perception, and reason, and cannot want a clear proof of him, as long as we carry ourselves about us. To show, therefore, that we are capable of knowing, that is, being certain that there is a God, and how we may come by this certainty, I think we need go no further than ourselves, and that undoubted knowledge we have of our own existence. I think it is beyond question that man has a clear perception of his own being; he knows certainly that he exists, and that he is something. In the next place, man knows, by an intuitive certainty, that bare nothing can no more produce any real being than it can be equal to two right angles. If, therefore, we know there is some real being, it is an evident demonstration, that from eternity there has been something: since what was not from eternity had a beginning, and what had a beginning must be produced by something else. Next it is evident that what has its being from nother, must also have all that which is in and belongs to its being from another too: all the powers it has must be owing to, and received from, the same source. This eternal source then of all beings, must be also the source and original of all power; and so this eternal being must be also the most powerful.

"Again, man finds in himself perception and knowledge: we are certain then that there is not only some being, but some knowing intelligent being, in the world. There was a time then when there was no knowing being, or else there has been a knowing being from eternity. If it be said, there was a time when that eternal being had no knowledge; I reply, that then it is impossible there should have ever been any knowledge; it being as impossible that things wholly void of knowledge, and operating blindly, and without any perception, should produce a knowing being, as it is impossible that a triangle should make itself three angles bigger than two right ones. Thus, from the consideration of ourselves, and what we infallibly find in our own constitutions, our reason leads us to the knowledge of this certain and evident truth, that there is an eternal, most powerful, and knowing Being, which whether any one will call God, it matters not. The thing is evident; and from this idea, duly considered, will easily be deduced all those other attributes we ought to ascribe to this eternal Being.

"From what has been said, it is plain to me, that we have a more certain knowledge of the existence of a God than of any thing our senses have not immediately discovered to us. Nay, I presume I may say, that we more certainly know that there is a God, than that there is any thing else without us. When I say we know, I mean there is such a knowledge within our reach which we cannot miss, if we will but apply our minds to that as we do to several other enquiries.

"It being then unavoidable for all rational creatures to conclude that something has existed from eternity, let us next see what kind of a thing that must be. There are but two sorts of beings in the world that man knows or conceives; such as are purely material, without sense or perception; and sensible perceiving beings, such as we find ourselves to be. These two sorts we shall call cogitative and incogitative beings; which, to our present purpose, are better than material and immaterial.

"If then there must be something eternal, it is very obvious to reason that it must necessarily be a cogitative being; because it is as impossible to conceive that bare incogitative matter should ever produce a thinking intelligent being, as that nothing of itself should produce matter. Let us suppose any parcel of matter eternal, we shall find it in itself unable to produce any thing. Let us suppose its parts firmly at rest together; if there were no other being in the world, must it not eternally remain so, a dead unactive lump? is it possible to conceive that it can add motion to itself, or produce any thing? Matter then, by its own strength, cannot produce in itself so much as motion. The motion it has must also be from eternity, or else added to matter by some other being more powerful than matter. But let us suppose motion eternal too; but yet matter, incogitative matter, and motion could never produce thought. Knowledge will still be as far beyond the power of nothing to produce. Divide matter into as minute parts as you will, vary its figure and motion as much as you please, it will operate no otherwise upon other

bodies, of proportionable bulk, than it did before this division. The minutest particles of matter repel and resist one another just as the greater do, and that is all they can do; so that if we suppose nothing eternal, matter can never begin to be; if we suppose bare matter without motion eternal, motion can never begin to be; if we suppose only matter and motion eternal, thought can never begin to be; for it is impossible to conceive that matter, either with or without motion, coul have, originally in and from itself, sense, perception, and knowledge, as is evident from hence, that then sense, perception, and knowledge, must be a property eternally inseparable from matter, and every particle of it. Since, therefore, whatsoever is the first eternal being, must necessarily be cogitative; and whatsoever is first of all things must necessarily contain in it, and actually have, at least, all the perfections that can ever after exist; it necessarily follows that the first eternal being cannot be matter. If, therefore, it be evident, that something must necessarily exist from eternity, it is also as evident that that something must be a cogitative being. For it is as impossible that incogitative matter should produce a cogitative being, as that nothing, or the negation of all being, should produce a positive being or matter.

'This discovery of the necessary existence of an eternal mind sufficiently leads us to the knowledge of God; for it will hence follow that all other knowing beings that have a beginning must depend on him, and have no other ways of knowledge, or extent of power, than what he gives them; and, therefore, if he made those, he made also the less excellent pieces of this universe, all inanimate bodies, whereby his omniscience, power, and providence, will be established; and from thence all his other attributes necessarily follow."

The existence of God is also farther evinced by those arguments which have been usually alleged to prove, that the world had a beginning, and, therefore, that it must have been created by the energy of divine power. In proof of this, the history of Moses, considered merely as the most ancient historian, deserves particular regard. His testimony is confirmed by the most ancient writers among the heathens, both poets and historians. It may be also fairly alleged, that we have no history or tradition more ancient than that which agrees with the received opinion of the world's beginning, and of the manner in which it was produced; and that the most ancient histories were written long after that time. And this consideration is urged by Lucretius, the famous Epicurean, as a strong presumption that the world had a beginning:

—— Si nulla fuit genitalis origo
Terrarum et cœli, semperque æterna fuere:
Quur supra bellum Thebanum, et funera Troiæ
Non alias aliei quoque res cecinere poetæ?

Yet grant this heaven, this earth the heaven surrounds,
Time ne'er produc'd, eternal of themselves—
Whence, ere the Theban war, and fate of Troy,
Have earlier bards no earlier action sung?

GOOD.

Besides, the origin and progress of learning, and the most useful arts, as is also observed by the same poet, confirm the notion of the world's beginning, and of the common æra of its creation: to which also may be added, that the world itself, being material and corruptible, must have had a beginning; and many phænomena occur to the observation of the astronomer and natural historian, which furnish a strong presumption, that it could have had no long duration, and that it gradually tends to dissolution. From all these considerations we may infer the existence, attributes, and providence of God.

The enquiring reader may farther consult, on this interesting topic, Baxter's Matho, vol. i., Clarke on the Attributes, Paley's Natural Theology, Hartley on Man, Doddridge's Lectures on Pneumatology, &c. Bishop Hamilton's works, vol. ii., O. Gregory's Astronomy, the concluding chapter, Brown's Compendious view of Natural and Revealed Religion, and Barrow on the Apostles' Creed. See also our articles ATTRIBUTES, CHRISTIANITY, PROVIDENCE, RELIGION, THEOLOGY, &c. And for the doctrine of three persons in one God, the article TRINITY.

God is also used in speaking of the false deities of the heathens, many of which were only creatures to which divine honours and worship were superstitiously paid. The Greeks and Latins, it is observable, did not mean by the name of God an all-perfect being, whereof eternity, infinity, omnipresence, &c. were sential attributes; with them, the word only implied an excellent and superior nature, and accordingly they give the appellation gods to all beings of a rank or class higher or more perfect than that of men, and especially to those who were inferior agents in the divine administration, all subject to the one Supreme. Thus men themselves, according to their system, might become gods after death; inasmuch as their souls might attain to a degree of excellence superior to what they were capable of in life.

The first divines, father Bossu observes, were the poets: the two functions, though now separated, were originally combined. Now the great variety of attributes in G that is, the number of relations, capacities, and circumstances, wherein they had occasion to consider him, put these poets, &c. under a necessity of making a partition, and of separating the divine attributes into several persons; because the weakness of the human mind could not conceive so much power and action in the simplicity of one single divine nature. Thus the omnipotence of God came to be represented under the person and appellation of Jupiter; the wisdom of God under that of Minerva; the justice of God under that of Juno. The first idols or false gods that are said to have been adored were the stars, sun, moon, &c. on account of the light, heat, and other benefits, which we derive from them. Afterwards the earth came to be deified, for furnish-

ing fruits necessary for the subsistence of men and animals; then fire and water became objects of divine worship, for their usefulness to human life. In process of time, and by degrees, gods became multiplied to infinity; and there was scarce any thing but the weakness or caprice of some devotee or other elevated into the rank of deity; things useless or even destructive not excepted. See DII and MYTHOLOGY.

To GOD. *v. a.* (from the noun.) To deify; to exalt to divine honours (*Shakspeare*).

GODALMING, a town in Surrey, with a market on Saturdays. It is seated on the Wey. Lat. 51. 13 N. Lon. 0. 34 W.

GODAVERY, or GUNGA, or GODOURY, a river of Hindustan, which rises about seventy miles north-east Bombay, and falls into the Bay of Bengal by several mouths, between lon. 81. 40 and 82. 30 E. Greenwich; lat. 16. 20 and 16. 50 N. This river is reckoned sacred by the Hindoos.

GODBOTE, in our old customs, a church fine

GO'DCHILD. *s.* (*god* and *child.*) A term of spiritual relation; one for whom one became sponsor at baptism, and promised to see educated as a christian

GO'DDAUGHTER. *s.* (*god* and *daughter.*) A girl for whom one became sponsor at baptism.

GODDARD (Jonathan), an English physician and chemist, was born at Greenwich about 1617. He was educated at Oxford, and having studied physic at that university, he went abroad. On his return he took his doctor's degree, and in 1646 he was chosen a fellow of the college of physicians, and the following year was appointed lecturer in anatomy to that society. He was greatly patronized by Cromwell, by whom he was made head physician to the army, and afterwards appointed warden of Merton college, and one of the council of state. On the restoration, Dr. Goddard was removed from his wardenship by the king. He then removed to Gresham college, where he had been chosen professor of physic in 1655. He now constantly attended those meetings in which the royal society originated; and on the incorporation of that body, by royal charter, in 1663, he was nominated one of the first council. He was deemed an able practitioner, and so conscientious that he constantly prepared his own medicines. He died in 1674. Bishop Ward says, that Dr. Goddard was the first Englishman who made a telescope..

GODDESS, a heathen divinity, to whom the female sex is attributed. The ancients had nearly as many goddesses as gods: for under this character they represented the virtues, graces, and principal advantages of life; as truth, justice, piety, fortune, victory, &c.

GODDES-LIKE. *a.* Resembling a goddess (*Pope*).

GODEAU (Anthony), a French bishop, was born in 1605. He was one of those who met at the house of M. Conrart to converse on polite literature, and communicate their productions, which society gave rise to the French academy of belles-lettres, of which Godeau was one of the first members. Cardinal Richelieu gave him the bishopric of Grasse, which he afterwards relinquished for that of Venice; at which place he died in 1671. He wrote an Ecclesiastical History, in 3 vols. folio; and a Translation of the Psalms into French verse.

GODFATHERS, and GODMOTHERS, persons who, at the baptism of infants, answer for their future conduct; and by this means lay themselves under an obligation, which ought to be reckoned indispensable, to instruct them, or to watch closely their actions. This custom is of great antiquity in the Christian church, and was probably instituted to prevent children being brought up in idolatry, in case their parents died before they arrived at years of discretion.

GODFATHERS, was also a term anciently given to a kind of seconds who attended and assisted the knights in tournaments.

GO'DHEAD. *s.* (from *god.*) 1. Godship; deity; divinity; divine nature (*Milton*). 2. A deity in person; a god or goddess (*Dryden*).

GO'DLESS. *a.* (from *god.*) Without sense of duty to God; atheistical; wicked; irreligious; impious (*Dryden*).

GO'DLIKE. *a.* (*god* and *like.*) Divine; resembling a divinity; supremely excellent (*Milton*).

GO'DLING. *s.* (from *god.*) A little divinity; a diminutive god (*Dryden*).

GO'DLINESS. *s.* (from *godly.*) 1. Piety to God. 2. General observation of all the duties prescribed by religion (*Hooker*).

GO'DLY. *a.* (from *god.*) 1. Pious towards God (*Common Prayer*). 2. Good; righteous; religious (*Psalms*).

GO'DLY. *ad.* Piously; righteously (*Hook.*).

GO'DLYHEAD. *s.* (from *godly.*) Goodness; righteousness (*Spenser*).

GODMANCHESTER, a large village (or, according to some, a borough) of Huntingdonshire, parted from Huntingdon by the river Ouse. It is seated in a rich and fertile soil, which yields great plenty of corn. Here is a school called The free grammar school of queen Elizabeth. When James I. came through this place from Scotland, the inhabitants met him with 70 new ploughs, drawn by as many teams of horses; in pursuance of the tenure by which they hold their land.

GO'DMOTHER. *s.* (*God* and *mother.*) A woman who has undertaken sponsion in infant baptism.

GO'DSHIP. *s.* (from *god.*) The rank or character of a god; deity; divinity (*Prior*).

GO'DSON. *s.* (*god* and *son.*) One for whom one has been sponsor at the font (*Shakspeare*).

GODSTOW, a place northwest of Oxford, in a sort of island formed by the divided streams of the Isis after being joined by the Evenlode. It is noted for fish, and their excellent manner of dressing them; but more so for the ruins of that nunnery which fair Rosamond quitted for the embraces of Henry II.

GO'DWARD. *a.* To *Godward* is *toward God.*

GODWIN SANDS, sandbanks off the

coast of Kent, between the N. and S. Foreland. They run parallel with the coast for three leagues, at about two and a half leagues distance, and add to the security of the capacious roads, The Downs. These sands occupy the space that was formerly a large tract of low ground, belonging to Godwin, earl of Kent, father of King Harold; and which being afterwards given to the monastery of St. Augustin, at Canterbury, the abbot neglecting to keep in repair the wall that defended it from the sea, the whole tract was drowned in the year 1100, leaving these sands, upon which many ships have been wrecked.

GODWIN (Mary Wollstonecroft), an ingenious writer, was born at Beverley in Yorkshire, in 1768. Her father was of a roving temper, and thereby considerably impaired his finances. In the 24th year of her age she opened a day-school at Islington, which was soon after transferred to Newington-green. She had for a partner a young lady to whom she was strongly attached, whom she accompanied in 1785 to Lisbon. On her return to England she entered into the family of lord Kingsborough, as governess to his daughters; in which, however, she remained but a short time. In 1787 she again settled in the metropolis, and had recourse to her pen for subsistence. She published a little work, intitled, Original Stories from real Life, for the use of children; translated some works from the French and German; and had some concern in the Analytical Review. In 1790 she published an answer to Burke's Reflections on the French Revolution, and the year following her Vindication of the Rights of Women. In 1792 she went to Paris, and there formed an unfortunate connection with an American named Imlay, by by whom she had a daughter. For him she undertook a voyage to Norway to regulate some commercial concerns. This tour occasioned her Letters from Scandinavia. On her arrival in England she found herself forsaken by this man, on whom she had placed an unrequited love. In this state of distress she resolved to destroy herself, and accordingly plunged into the Thames from Putney-bridge. She was saved, however, from the water, and restored to life. In 1796 she was married to Mr. William Godwin, the well-known author of an Enquiry concerning Political Justice, and other works. She died in child-birth in August 1797, and was buried in St. Pancras church-yard. Since her death have been published her posthumous works, consisting of Letters and Fragments; in which we meet with some true touches of nature, but they are disgraced with the intermixture of many expressions which are too indelicate, not only for the public eye, but even for private letters of the most confidential nature. This lady possessed strong and original powers of mind, but her notions, particularly on political and religious subjects, were frequently wild, visionary, and romantic.

GODWIT, in ornithology. See SCOLOPAX.

GO'DYELD. GO'DYIELD. *ad.* (corrupted from *God shield*, or protect).

GO'EL. *a.* (ᵹolep, Saxon.) Yellow (*Tusser*).

GO'ER. *s.* (from *go.*) 1. One that goes; a runner (*Shakspeare.*) 2. A walker; one that has a gait or manner of walking good or bad (*Wotton*).

GOES, or TER GOES, the capital of South Beveland, in Zealand, one of the United Provinces. Lat. 51. 33. N. Lon. 3. 50 E.

GOG, and MAGOG, the former signifying literally, *the roof of a house*, the latter, *covering*, are mentioned Ezekiel xxxviii and xxxix. and Rev. xx. and are, by most interpreters, taken in an allegorical sense for such princes and people as were enemies to the church and saints. Gog was prince of Magog, according to Ezekiel, and Magog the country or people; Magog is said to be second son of Japheth, Gen. x. 2. without mentioning Gog, whom Bochart places in the neighbourhood of Caucasus, which he calls *Gogchasan*, i. e. *the fortress of Gog*.

To GO'GGLE. *v. n.* To look asquint.

GOGGLE-EYED. *a.* (ᵹoeᵹleᵹen, Saxon). Squint-eyed; not looking straight (*Ascham*).

GOGUET (Antony-Yves), a French writer, and author of a celebrated work, intitled, *L'Origine des Loix, des Arts, des Sciences, & de leur Progres chez les anciens Peuples*, 1758, 3 vols. 4to. His father was an advocate, and he was born at Paris in 1716. He was very unpromising as to abilities, and reckoned even dull in his early years; but his understanding developing itself, he applied to letters, and at length produced the above work. The reputation he gained by it was great: but he enjoyed it a very short time; dying the same year of the small pox, which disorder it seems he always dreaded. It is remarkable that Conrad Fugere, to whom he left his library and his MSS. was so deeply affected with the death of his friend, as to die himself three days after him. The above work has been translated into English, and published in 3 vols. 8vo.

GOGMAGOG HILLS, four miles E. of Cambridge, are the most elevated in the county, and afford a good prospect from their summit. They are noted for the entrenchments and other works cast up there, whence some suppose they were the site of a Roman camp.

GO'ING. *s.* (from *go.*) 1. The act of walking (*Shakspeare*).) 2. Pregnancy (*Grew.*). 3. Departure (*Milton*).

GO'LA. *s.* The same with CYMATIUM.

GOLCONDA, a country of the Decan of Hindoostan, situated between the lower parts of the rivers Kisna and Godavery, and the principal parts of Dowlatabad. It was formerly called Tellingana, or Tilling, and is now subject to the Nizam of the Decan. It abounds in corn, rice, and cattle; but it is most remarkable for its diamond mines, the most considerable in the world. The black merchants buy parcels of ground to search for these precious stones in. They sometimes fail in meeting with any, and in others they find immense riches. They have also mines of salt,

fine iron for sword-blades, and curious calicoes and chintzes. Hydrabad is the capital.

GOLCONDA, a celebrated fortress in the country of the same name, situated about six miles W. N. W. of Hydrabad, and joined to that city by a wall of communication. It occupies the summit of a hill of a conical form, and is deemed impregnable.

GOLD. Of this metal we have already treated in a mineralogical and systematic view under the article AURUM. It yet remains for us to contemplate it in a metallurgic point of view, and as appropriated to the arts and the purposes of coin.

Metallurgic processes. The richest gold mines, concerning which we have any particular description, are those of Hungary; and we shall hence pay some attention to these establishments. The high commercial value of gold, compared with that of every other metal, depends in a considerable degree on its rarity; hence even the most profitable veins of gold are of trifling magnitude, and will pay very well to the miner, though intimately mixed with so large a proportion of stony gangue and other impurities as would render it impossible to work any other metal similarly circumstanced. In the Hungarian mines the attention of the miner is not confined to the strings of ore, but the whole contents of the vein are usually extracted. It is raised for the most part in large masses to the surface, and is then distributed to the workmen, who break it first with large hammers, and afterwards with smaller ones till it is reduced to pieces of the size of a walnut or less. During this process each piece is attentively examined and arranged according to its value. The native gold, even to the smallest visible grain, is separated as accurately as possible from the quarter in which it is chiefly imbedded, and put by itself: the auriferous galena and pyrites are also thrown into separate heaps. The small splinters detached during this process, as well as the sand and mud of the mine, are also collected, washed, and sifted, and arranged according to their fineness and apparent richness. The portion rejected in this first examination is afterwards re-examined by boys, whose time is of little value, and who pick out nearly the whole of what has been overlooked by the men, and sort it in the manner just mentioned.

The native gold with its adhering matrix is again broken by hand into still smaller pieces, by which an additional quantity of impurities and stony matter is got rid of: it is then put into a kind of wooden box, floored with cast iron plates, and reduced to a heavy powder by the action of two or more heavy spars of oak shod with iron, and worked alternately in the manner of a common stamping mill. This powder, or flour, as it is called, being now removed into a convenient vessel like a large bason, is mixed with a sufficient quantity of salt and water to render it damp, after which a workman takes a thin porous leather bag, puts a quantity of mercury into it, and by a continued regular pressure forces the mercury in minute drops, like dew, through the leather: in this minutely divided state it falls upon the pulverised ore, and is immediately kneaded up with it till the requisite quantity (depending in a great measure on the proportion of gold) has been added. This part of the process being completed, the mixture is rubbed together by a wooden pestle for some time to expedite the incorporation of the mercury and gold, and is afterwards heated in a proper vessel to about the temperature of boiling water for three or four days. Finally, the mixture is washed very carefully by small parcels at a time, the earthy particles are carried off by the water, and there remains behind only the mercury combined with the gold into an amalgam. Part of the mercury is then separated by pressure in a leathern bag, and the rest is driven off by distillation, leaving behind only the gold and the silver with which it may happen to be alloyed.

Native gold is thus extracted from its ore. But a much more complicated process is required to separate that portion of the metal which is dispersed invariably in the pyrites, ochre, galena, and other metallic substances, as well as the stony parts of the gangue. These, in the sorting already described, are separated not only according to their apparent richness, but, what is of more importance, are also arranged according to their hardness.

This being completed, they are transferred to the stamping mill, which is a complicated machinery that first pounds them into a very fine or coarser powder, according to the nature of the combination, the pounding being never carried to a finer result than is absolutely necessary; after which the pulverised matter is, by the same machinery, washed, in consequence of the admission of a stream of water into the coffer that contains it, into shallow channels or troughs of various dimensions, constructed either of wood or stone, and communicating at their extremities with each other, the whole series being called a labyrinth; these are separated from each other by sliders; and when the material of greatest specific gravity, and which may first be supposed to settle, has deposited, another slider is added, and fresh portion of water admitted from the coffer. After which another labyrinth is opened, and then a third, till the whole are progressively filled, taking care not to mix what has been deposited in one channel with what has been deposited in the others. After this the one is accurately mingled with a little quick lime by way of flux, and with galena proportioned to the quantity of gold and silver that the pyrite (where much pyrite exists) is found to contain according to the result of a previous essay. The mixture being next placed in a reverberating furnace is made red hot, and, as soon as it begins to clot together, is stirred up from time to time, and kept at a temperature inadequate to its fusion, till part of the sulphur is driven off: this being effected, the fire is increased, the whole is brought to a state of thin fusion, and then let out into a mould of sand. It is afterwards broken into small pieces, and roasted and fused once or twice more, till all the sulphur and other impurities are got rid of, and nothing remains but the various metals with which it is combined, usually silver and copper, but occasionally lead, antimony, platina, and iron.

The separation of gold from these metals constitutes the process of refining. Lead is separated upon a large scale, by what is called testing, or converting the lead into a vitreous oxyd: antimony by the use of sulphur, which, while it will not unite with the gold, converts the antimony into a sulphuret. This sulphuret of antimony may be afterwards employed to separate gold from silver, as well as from the imperfect metals. While it is usually separated from platina by mercury, which unites less rea-

dily with platina than with gold, and of course leaves the platina pure. The gold is afterwards separated from the mercury by distillation.

Application of Gold to a variety of the arts.—Under this head we shall consider the processes of *gold-beating* and *gilding in general.*

Gold-beating, including the mode of manufacturing *gold leaf* and *gilt wire.*

The colour of pure gold, by reflected light, is a full bright yellow, verging on one hand towards orange, and on the other towards brass yellow: it is remarkable that gold fused with borax becomes considerably paler than usual, and, on the other hand, when fused with nitre, it becomes more highly coloured, without any other perceptible change being induced by either of these salts; hence as this metal is reckoned beautiful in proportion to the fullness and brilliancy of its colour, the borax flux used by the goldsmiths is generally mixed with a sufficient quantity of nitre to counterbalance its discolouring property. The colour of gold, when in high fusion, is blueish green, of nearly the same tint with that of gold by transmitted light this latter may conveniently be observed by laying a leaf of gold between two thin plates of colourless glass, and holding it between the eye and a strong light.

The specific gravity of gold is only inferior to that of platina: with regard to its precise amount a considerable variation may be observed on comparing the reports of different authors, one stating it as high as 20, and another as low as 18·75 This difference is no doubt in part attributable to slight impurities in the gold itself, partly also to imperfection in the balances made use of, to differences of temperature, to the gold's being cast in sand or metal, to its being hammered or not, and to other causes, which, in the article ALLOY, we have briefly pointed out as affecting the specific gravity of metallic substances. According to an experiment by Mr. Ellicot, whose accuracy is well known, the specific gravity of an ingot of gold refined by antimony was =19·184, and of the same, when hammered,= 19.207. According to Lewis, the specific gravity of fine gold at 53° Fah. amounted to 19·376. Brisson reports the specific gravity of fine gold in ingot to be=19·258, and the same, when hammered, = 19·361. In hardness this metal ranks somewhat above silver and below copper. It is extremely flexible, and so tough, that, when at length by repeated bending it is made to break, both the fractured pieces appear terminated by a wedge-shaped extremity. From its softness and toughness it receives, with perfect exactness, the impression of the dies in coining, and, for the same reasons, it does not file freely, clogging up the teeth of the instrument in a very short time. It possesses little elasticity or sonorousness. It receives great brilliance from the burnisher, but not from the action of polishing powders. It is inodorous and insipid. The tenacity of gold is by no means so great as was supposed by the earlier chemists; it is inferior in this respect to iron, copper, platina, and silver. A wire of gold, $\frac{1}{12}$ of an inch in diameter, will support about 254 lbs. of avoirdupois, before it breaks. It is extremely malleable both when hot and cold, and very ductile.

In consequence of the high commercial value of gold, it is scarcely ever employed in mass, or in thick plates, for ornamental purposes; but advantage has been taken of its remarkable malleability to reduce it into leaves of an almost incredible thinness; so that in this state, notwithstanding its high specific gravity, it will float in the air like a feather. Of the ingenious art called gold-beating, we shall proceed to give a short account.

The gold selected for this purpose is as pure as possible; the quantity used at one time by the English artists is two ounces. This being melted in a black-lead crucible with some borax, is poured into an iron mould, previously heated and greased, by which it is formed into a plate six or eight inches long, and three quarters of an inch wide. This plate is heated red hot, in order to burn off the tallow, and is then extended by forging on an anvil, and afterwards passed between steel rollers, till it becomes a long ribband as thin as paper. The ribband is now cut into 150 equal pieces, each of which is forged on an anvil, till it is about an inch square, after which they are well annealed. Each of the squares in this state weighs six grains and four tenths, and in thickness is equal to $\frac{1}{766}$ of an inch. The 150 plates of gold thus produced are interlaid with pieces of very fine vellum, about four inches square, and about twenty vellum leaves are placed on the outsides; the whole is then put into a case of parchment, over which is drawn another similar case, so that the packet is kept close and tight on all sides. Being now laid on a smooth block of marble, from 200 to 600 lbs. in weight, the heavier the better, the workman begins the beating with a round-faced somewhat convex hammer, called the catch hammer, weighing sixteen pounds; the packet is turned occasionally upside down, and beaten with strong but not acute strokes, till the gold is extended nearly to an equality with the vellum leaves, to ascertain which the packet is opened from time to time, and also bent and rolled between the hands to facilitate the extension of the gold between the leaves. This first part of the process being completed, the packet is then taken to pieces, and each leaf of gold is divided into four, with a steel knife; the 600 pieces thus produced are interlaid with pieces of oxgut, of the same dimensions, and used in the same manner as the vellum. The beating is continued, but with a lighter hammer, called the shoddering hammer, and weighing about twelve pounds, till the gold is brought to the same dimensions as the interposed membrane. It is now again divided into four, by means of a piece of cane cut to an edge, the leaves being by this time so light, that any accidental moisture, condensing on an iron blade, would cause them to adhere to it. The 2400 hence resulting are parted into three packets, with interposed membrane as before, and beaten with the finishing or gold hammer, weighing about ten pounds, till they acquire an extent equal to the former. The packets are now taken to pieces, and the gold leaves, by means of a cane instrument and the breath, are laid flat on a leathern cushion, and cut one by one, to an even square, by a cane frame; they are lastly laid in books of 25 leaves each, the paper of which is previously smoothed, and rubbed with red bole, to prevent them from adhering. Hence it appears, that each of the inch square pieces, into which the ribband of gold was divided, is extended, by beating, to 196 square inches, or 16 leaves, weighing 0·4 of a grain each, and not exceeding in thickness $\frac{1}{150136}$ of an inch. Each grain of gold furnishes 30·6 square inches.

Gold wire, as it is called, is in fact only silver wire gilt, and is prepared in the following manner: A solid cylinder of fine silver, weighing about twenty pounds, is covered with thick leaves of gold, which are made to adhere inseparably to it by means of the burnisher: successive laminæ are thus applied, till the quantity of gold, if intended for common gold wire, amounts to 100 grains for every pound troy of silver; if for double gilt wire, to about 140 grains.

This gilt silver rod is then drawn successively through holes made in a strong steel plate, till it is reduced to the size of a thick quill, care being taken to anneal it accurately after each operation. The succeeding process is similar to the former, except that a mixed metal, somewhat softer than steel, is employed for the drawing plates, in order to prevent the gilding from being stripped off, and no further annealing is requisite, after it is brought to be as slender as a crow quill. When the wire is spun as thin as is necessary, it is wound on a hollow copper bobbin, and carefully annealed by a very gentle heat: finally, it is passed through a flatting-mill, and the process is complete.

According to Dr. Halley, six feet in length of the finest gilt wire before flatting, will counterpoise no more than a grain: and as the gold is not quite $\frac{1}{17}$ of the whole, a single grain of gold thus extended will be 345·6 feet long. By the operation of flatting, the length of the wire is increased about a seventh, and its width is equal to $\frac{1}{48}$ of an inch: hence the surface occupied by one grain is equal to 98.7 square inches, with a thickness of $\frac{1}{490444}$ of an inch.

Gilding in general.—One of the most valuable properties of gold is, that of its extreme ductility, which we have just noticed, for without this, it could seldom, on account of its dearness, be employed in substance, and its ornamental use would be extremely limited. It is in consequence of this property, that we are able to cover almost any substance with layers almost infinitely fine, and to make them assume the appearance and possess the extreme beauty of this precious metal. And on this the art of gilding depends.

The materials of gilding, or rather the different states in which gold is used for this purpose, are the following: leaf-gold of different thicknesses, and formed either of the pure metal, or of an alloy of this with silver, amalgam of gold, and gold powder. Gilding is performed either with or without the application of heat. By the first of these methods, those substances are gilt which are not liable to attraction by exposure to a moderate heat, such as metals, and sometimes glass and porcelain: the second method is practised with those substances, such as wood, paper, leather, silk, lacquered and japanned ware, &c. which would be injured and even destroyed at the temperature requisite for gilding the former. This last is the simplest method, and we will describe it before we proceed to the art of gilding by heat.

On wood there are two methods of gilding, viz. oil-gilding, and burnished gilding. The first is thus performed: the wood must first be covered or primed with two or three coatings of boiled linseed oil and white lead, in order to fill up the pores and conceal the irregularities of the surface occasioned by the veins in the wood. When the priming is quite dry, a thin coat of gold size must be laid on. This is prepared by grinding together some strongly calcined red ochre with the thickest drying oil that can be procured, and the older the better: that it may work freely, it is to be mixed, previously to being used, with a little oil of turpentine, till it is brought to a proper consistence. If the gold size is good, it will be sufficiently dry in twelve hours, more or less, to allow the artist to proceed to the last part of the process, which is the application of the gold. For this purpose, a leaf of gold is spread on the cushion (formed by a few folds of flannel, secured on a piece of wood about eight inches square by a tight covering of leather), and is cut into strips of a proper size, by a blunt parallel knife; each strip being taken up on the point of a fine brush, is applied to the part intended to be gilded, and is then gently pressed down by a ball of soft cotton; the gold immediately adheres to the sticky surface of the size, and after a few minutes, the dexterous application of a large camel's hair-brush sweeps away the loose particles of the gold leaf without disturbing the rest. In a day or two the size will be completely dried, and the operation is finished. The advantages of this method of gilding are that it is very simple, very durable, not readily injured by changes of weather, even when exposed to the open air, and when soiled it may be cleaned with a little warm water and a soft brush; its disadvantage is that it cannot be burnished, and therefore wants the high lustre produced by the next method. Its chief employment is in out-door work. Burnished gilding, or gilding in distemper, is thus performed: the surface to be gilt must first be carefully covered with strong size, made by boiling down pieces of white leather, or clippings of parchment, till they are reduced to a stiff jelly; this coating being dried, eight or ten more must be applied, consisting of the same size, mixed with fine Paris plaster, or washed chalk; when a sufficient number of layers have been put on, varying according to the nature of the work, and the whole is become quite dry, a moderately thick layer must be applied, composed of size and bole, or yellow ochre; while this last is yet moist, the gold leaf is to be put on in the usual manner; it will immediately adhere on being pressed with the cotton ball, and, before the size is become perfectly dry, those parts which are intended to be the most brilliant are to be carefully burnished with an agate or dog's tooth. In order to save the labour of burnishing, it is a common but bad practice slightly to burnish the brilliant parts, and to deaden the rest by drawing over them a brush dipped in size; the required contrast between the polished and unpolished gold is indeed thus obtained, but the general effect is greatly inferior to that produced in the regular way, and the smallest drop of water falling on the sized part occasions a stain. This kind of gilding can only be applied on in-door work, as rain, and even a considerable degree of dampness, will cause the gold to peel off. When dirty it may be cleaned with a soft brush, and hot spirits of wine, or oil of turpentine. It is chiefly used on picture-frames, mouldings, and stucco.

Letters written on vellum or paper are gilded in three ways: in the first, a little size is mixed with the ink, and the letters are written as usual; when they are dry, a slight degree of stickiness is produced by breathing on them, upon which the gold leaf is immediately applied, and by a little pressure may be made to adhere with sufficient firmness: in the second method some white lead or chalk is ground up with strong size, and the letters are made with this by means of a brush; when the mixture is almost dry, the gold leaf may

be laid on, and afterwards burnished: the last method is to mix up some gold powder with size, and make the letters of this by means of a brush. The edges of the leaves of books are gilded while in the binder's press, by first applying a composition formed of four parts of Armenian bole, and one of sugarcandy, ground together to a proper consistence, and laying it on by a brush with the white of an egg; this coating, when nearly dry, is smoothed by the burnisher, it is then slightly moistened with clean water, and the gold leaf applied, and afterwards burnished. In order to impress the gilt figures on the leather covers of books, the leather is first dusted over with very fine powdered rosin or mastich, then the iron tool by which the figure is made is moderately heated, and pressed down upon a piece of leaf gold, which slightly adheres to it; being then immediately applied to the surface of the leather with a certain force, the tool at the same time makes an impression, and melts the mastich, which lies between the heated iron and the leather; in consequence of this the gold with which the face of the tool is covered is made to adhere to the leather, so that, on removing the tool, a gilded impression of it remains behind.

Drinking-glasses and other utensils of this material are sometimes, especially in Germany, gilt on their edges; this is done in two ways, either by a simple adhesive varnish, or by means of fire. The varnish is prepared by dissolving in drying linseed oil a quantity of gum anime, or, still better, of clear amber equal in weight to the oil; a very drying and adhesive varnish is thus prepared, which being diluted with a proper quantity of oil of turpentine is to be applied as thin as possible to those parts of the glass which are to be gilded; when this is dry, which will be in about a day, the glass is to be placed by the fire side, or in a stove, till it is so warm as almost to burn the fingers when handled: at this temperature the varnish will become glutinous, and a piece of leaf gold applied in the usual way will immediately adhere; when the gilding is thus put on, and before it is grown quite cold, it may be burnished, taking care only to interpose a piece of very thin paper between the gold and the burnisher. If the varnish is very good, this is the best method of gilding glasses, as the gold is thus fixed on more evenly than in any other way: it often happens, however, when the varnish is but indifferent, that by repeated washing the gold soon wears off; on this account the practice of burning in is sometimes had recourse to. For this purpose some powdered gold is tempered with gum water and borax, and in this state applied to the clean surface of the glass with a fine camel's hair pencil; when quite dry, the glass is put into a stove heated to about the temperature of an annealing oven, the gum burns off, and the borax, by vitrifying, cements the gold with great firmness to the glass; after which it may be burnished. The gilding upon porcelain is in like manner fixed by fire and borax; and this kind of ware, being neither transparent nor liable to soften, and thus injure its form in a low red heat, is free from the risk and injury that the finer and more fusible kinds of glass are apt to sustain from such treatment.—All the methods of gilding hitherto described resemble each other, by being accomplished by means of some adhesive medium: this, however, is not the case with gilding upon metals; the gold is brought into immediate contact with the other metal, and they both remain firmly united merely by the attraction of adhesion subsisting between them. The simplest of all the kinds of gilding on metal, and which strikingly demonstrates the power of the affinity of adhesion, is one that is sometimes practised on plane surfaces of copper and iron with considerable success. The metal being previously polished and quite clean, is heated to about the temperature of melted lead, and covered with a double layer of gold leaf; by the cautious application of a blood-stone burnisher applied gently at first, and increasing the force of the pressure by degrees, the surfaces of gold and copper are brought to touch each other in almost every point, and then adhere with a force proportioned to the completeness of the contact. The first layer being thus burnished down, a second is made to adhere in the same manner, and sometimes a third, if the gilding is intended to be very solid. The objection to this method of gilding is its tediousness, and the almost impossibility of using a sufficient pressure without injuring the evenness of the gilded surface; where these objections do not apply, there cannot be a more effectual mode of gilding, as is evident from the manufacture of gilt silver or copper wire. The bar, before it is committed to the wire-drawer, is plated with gold, by having several leaves of gold burnished down upon it, and being then subjected to the strong compression that takes place in wire drawing, the gold and the other metal become so perfectly united as to form in a manner but one substance. The most usual method of covering the surface of a metal with gold is by means of an amalgam, or, as it is technically called, water gilding. If the metal to be gilt is silver, the best way of proceeding is first to soak it in warm dilute muriatic acid, that the surface may be rendered perfectly clean; it must then be washed in clean water changed two or three times to get rid of the whole acid; being afterwards dried and made moderately warm, a little gold amalgam, also warm, is to be carefully and evenly spread upon the silver, to which it will immediately adhere: when this is completed, the piece is placed upon a convenient support over a clear charcoal fire, and while the mercury is evaporating, if any specks or places appear that have escaped the amalgam, a small piece is to be laid on and spread with a brush to supply the deficiency, without removing the article from the fire. After a time the whole of the mercury will be driven off, and the piece, after cooling, being accurately examined, will be found to be entirely covered with a thin coating of pale dull gold. The small roughnesses and loosely adhering particles are now to be removed with a scratch brush, which is made of some exceedingly fine brass wire, bound together into a tuft; by this the surface is rendered perfectly smooth and bright, but it still remains of a pale yellow colour: this defect is next removed by warming the piece and smearing it over with gilder's wax, a composition of bees-wax, red ochre, verdigris, and green vitriol or alum. The wax being burnt off over a charcoal fire, and the piece quenched in urine, the colour of the gilding will be found to be much heightened; if it is not sufficiently so by the first application, a succeeding one will complete the desired effect; after which the work may be burnished or not, according to the taste of the artist. Instead of the common gilder's wax, a mixture of equal parts of nitre, sal ammoniac, green vitriol, and verdigris, moistened with water, will answer the purpose.

Copper and the alloys formed by its combination with zinc, are gilded nearly in the same way as silver; but as their affinity for mercury is considerably less than that of silver, it would be difficult to make the amalgam of gold adhere to the burnished surface of these metals by the same means and with the same evenness as takes place in the case just described, and hence nitric acid is employed to facilitate the adhesion of the copper and mercury: by which aid five grains of gold may be made completely to gild both the upper and under surfaces of 144 copper buttons, each of them an inch in diameter.

Iron, or rather steel, is gilt with great difficulty: for if a high heat be employed for this purpose, the temper of the steel will hereby be injured and reduced too low. One of the best plans lately recommended, is a mixture of sulphuric ether with nitro-muriat of gold: if ether thus charged with gold be spread, by means of a fine brush, on the surface of highly polished steel, the ether will presently evaporate, and leave the gold behind in close contact with the steel; at which time the adhesion will be considerably improved by an application of the burnisher. The dearness, and especially the rapid volubility of ether, are objections of some moment, but may be got over by using the best oil of turpentine instead of the ether, which has nearly the same efficacy in decomposing the nitro-muriat of gold; and while much cheaper, is by no means so quickly evaporable.

Application of Gold to the purposes of Coin.—The high value of gold renders it at all times expedient to preserve it as free from the wash produced by friction as possible: but more especially so when it is converted into coin, and thus becomes a standard measure of value; and is extremely liable to wear out by an incessant circulation.

It is hence constantly alloyed with some other metal that is capable of giving it additional hardness, and in just such a quantity as is sufficient to produce this effect. In the standard gold of our own country, copper is the alloy employed for this purpose, and the proportion is that of thirty-eight grains to the ounce. The gold thus intermixed, at the same time that it is rendered harder, is as ductile as in its state of purity. The colour is changed to a deeper yellow, and its specific gravity is remarkably diminished beyond the mean of its ingredients.

This last result is a very extraordinary fact, and has led to an examination of the effect produced by an intermixture of gold with other alloys, so as to decide which might be most advantageously employed as an alloy for gold coin, by enabling the metal to retain bulk for bulk the nearest approach to its own specific gravity when pure, at the same time that it augments its hardness, and does not detract from its ductility. These enquiries were lately entered upon with great spirit, by Mr. Hatchet and Mr. Cavendish, and the general result of them has been communicated to and since published by the Royal Society.

Arsenic, on account of its volatility, can be combined with gold only in small proportions. The alloy, or mixed metal hence produced, is of a grey colour, coarse granular fracture, and very brittle.

Antimony, mixed by fusion with either fine or standard gold in the proportion of not more than ¼ gr. to the ounce, (being not more than $\frac{1}{1920}$ of the whole mass) will give a brittle compound of a close granular fracture, with little metallic lustre: while with a change quite as extraordinary as in the production of standard gold, though of a different character, its bulk will be found remarkably greater than would be deduced from the mean specific gravity of its ingredients.

Zinc forms with gold an alloy of a brass-yellow colour; in other respects its action resembles that of arsenic. The specific gravity of the compound is somewhat greater than the calculated mean, when the zinc constitutes $\frac{1}{12}$ of the mass.

Cobalt, mixed with standard gold in the proportion of four grains to an ounce, renders the colour somewhat paler, and induces a slight degree of brittleness, but does not materially alter the gravity. In the proportion of 38 grs. to the ounce it renders the gold very brittle, and gives it an earthy fracture.

Nickel, mixed in the proportion of 38 grains to the ounce, produces an alloy of the colour of fine brass, with a coarse-grained earthy fracture and very brittle: its specific gravity being somewhat less than the mean.

With *manganese*, in its black oxyd, gold will combine, and produce an alloy of a reddish grey, capable of receiving a brilliant lustre like steel: the mixed metal is exceedingly hard, and so far possessed of ductility, as to be in some measure flattened by the hammer before it breaks.

With *bismuth*, in the proportion of 38 grains to the ounce, it yields an alloy of a pale greenish yellow, excessively brittle, and exhibiting a fine-grained earthy fracture: its specific gravity somewhat greater than the mean. If standard gold be alloyed with even a quarter of a grain of bismuth in the ounce, the mixture, although in colour and texture resembling gold, is yet perfectly brittle.

Lead, melted with gold, in the proportion of 38 grains in the ounce, gives an alloy externally resembling fine pale gold, but which is as brittle as glass, is wholly destitute of metallic lustre, and has a fine-grained porcellaneous appearance: its specific gravity a little less than the mean. The very fumes of this metal are nearly as prejudicial to the ductility of gold as those of bismuth.

Tin, mixed with gold in the proportion of 38 grs. to the ounce, forms a pale yellow alloy with a somewhat earthy fracture; it may be bent without breaking, but is very little ductile: its specific gravity is considerably greater than the mean of the ingredients.

Iron, in the state of bar, cast, or steel, may be combined with gold to the amount of 38 grains, and probably much more in the ounce, without impairing its durability: the colour of the alloy is pale yellowish grey, approaching to dull white: it is considerably harder than standard gold, and its specific gravity is somewhat less than the mean of its constituent ingredients.

Platina and gold, when the proportion of the former amounts to 38 grains in the ounce, compose an alloy of a yellowish white colour, like burnished silver, perfectly ductile, but much harder, and considerably more elastic, than standard gold.

Silver may be alloyed with gold in all proportions, and occasions hardly any perceptible alteration of ductility, hardness, or mean specific gravity: the colour of the mass becomes paler exactly as the quantity of the silver is increased.

Quicksilver and gold unite with the utmost readiness into an amalgam. The smallest quantity of the former renders the alloy extremely brittle. Amalgam of gold is of a yellowish white colour, and crystallizes in tetrahedral prisms when composed of six parts of mercury to one of gold.

Copper we have already noticed in speaking of

standard gold. It is not, however, every kind of reputedly pure copper that can safely be used for alloying gold as a material for minting: even the Swedish dollar copper occasionally renders the gold which it is mixed as brittle as glass. This appears to be owing to the lead and antimony which most copper contains, and which, though not in sufficient quantity to affect in any material degree the ductility of the copper itself, are fully adequate to destroy the ductility of the gold with which they are mixed.

GOLD-FINCH, in ornithology. See FRINGILLA.

GOLD-FINNY, in ichthyology. See LABRUS.

GOLD-FISH, in ichthyology. See CYPRINUS.

GOLDBEATER, one whose occupation is to beat or foliate gold. See GOLD.

GOLDBERG, a town of Silesia, in the duchy of Lignitz. The inhabitants are engaged in manufactures of woollen and linen. Lat. 51. 3 N. Lon. 16. 23 E.

GOLDBOUND. *a.* Encompassed with gold (*Shakspeare*).

GOLD COAST, a maritime country of Guinea, where the Europeans have several forts and settlements. It reaches from the Gold River, 12 miles W. of Assine, and ends 8 miles E. of Acraw, being about 180 miles in length. It includes several districts, in which are two or three small towns, lying on the sea-shore. The negro inhabitants are generally very rich, as they carry on a great trade with the Europeans for gold; and many of them are employed in fishing, and cultivating rice, which grows in incredible quantities. This they exchange with others for Indian corn, yams, potatoes, and palm oil. Most of the inhabitants go naked; and those who are best clothed have only some yards of stuff wrapped about their middle.

GO'LDEN. *a.* (from gold.) 1. Made of gold; consisting of gold (*Dryden*). 2. Shining; bright; splendid; resplendent (*Crashaw*). 3. Yellow; of the colour of gold (*Mortimer*). 4. Excellent; valuable (*Dryden*). 5. Happy; resembling the age of gold (*Shakspeare*).

GOLDEN EYE, in ornithology. See ANAS.

GOLDEN FLEECE (Order of the), a military order instituted by Philip the Good, duke of Burgundy, in 1429. It took its denomination from a representation of the golden fleece, borne by the knights on their collars, which consisted of flints and steels.

GOLDEN FLY, in entomology. See CHRYSIS.

GOLDEN MOUSE-EAR, in botany. See HIERACIUM.

GOLDEN NUMBER, in chronology, a number shewing what year of the Metonic or lunar cycle any given year is. To find the golden number, add 1 to the given year, and divide the sum by 19; what remains will be the golden number; unless 0 remain, for then 19 is the golden number.

The discovery of the Metonic cycle exhibited such extensive astronomical knowledge, that it obtained great success and reputation in Greece, insomuch that the order of the period was engraved in letters of gold; whence it acquired the name of Golden Number.

GOLDEN ROD, in botany. See SOLIDAGO.

GOLDEN ROD TREE, in botany. See ROSEA.

GOLDEN ROSE. The pope annually consecrates a golden rose on the fourth Sunday in Lent, which is sent to princesses, or to some church, as a mark of his peculiar affection.

GOLDEN RULE, the name usually given by arithmeticians to the Rule of Proportion, or Rule of Three, on account of its extensive usefulness.

GO'LDENLY. *ad.* (from *golden*.) Delightfully; splendidly (*Shakspeare*).

GO'LDFINDER. *s.* (*gold* and *find*.) One who finds gold. A term ludicrously applied to those that empty jakes (*Swift*).

GO'LDSIZE. *s.* A glue of a golden colour.

GO'LDSMITH. *s.* (ᵹolδ and ꞅmıꞇ, Saxon.) 1. One who manufactures gold (*Shakspeare*). 2. A banker; one who keeps money for others in his hands (*Swift*).

The goldsmith's work is either performed in the mould, or beat out with the hammer, or other engine. All works that have raised figures are cast in a mould, and afterwards polished and finished: plates, or dishes, of silver or gold, are beat out from thin flat plates; and tankards, and other vessels of that kind, are formed of plates soldered together, and their mouldings are beat, not cast. The business of the goldsmiths formerly required much more labour than it does at present; for they were obliged to hammer the metal from the ingot to the thinness they wanted: but there are now invented flatting-mills, which reduce metals to the thinness that is required, at a very small expence. The goldsmith is to make his own moulds, and for that reason ought to be a good designer, and have a taste in sculpture: he also ought to know enough of metallurgy to be able to assay mixed metals, and to mix the alloy. The goldsmiths in London employ several hands under them for the various articles of their trade; such are the jeweller, the snuff-box and toy maker, the silver turner, the gilder, the burnisher, the chaser, the refiner, and the gold-beater.

GOLDSMITHS' COMPANY. See COMPANY.

GOLDSMITH (Oliver), a celebrated writer, was born at Roscommon in Ireland, on Nov. 29th, 1728. His father had nine children, five sons, and four daughters: Oliver was the second son. He was intended by his father for some mercantile employment, and with this view received a scanty instruction in his native village. But some early specimens of his wit and genius induced his father, at the instigation and with the assistance of some liberal friends, to send him to the university; he was, therefore, after a preparatory education at some good schools, sent to Dublin college, in June 1744. Here he was guilty

of some indiscretions, and, in consequence of some harsh treatment from the tutor, fled from college. By the assistance of an uncle, he was removed, about 1752, from Ireland to Edinburgh for the purpose of studying physic. Here he continued till the year 1754, when he passed over to Rotterdam and thence to Leyden, where he studied chemistry under Gaubius and anatomy under Albinus. On leaving Leyden, he made the tour of a great part of Europe on foot, and met with many adventures which he has related in his Vicar of Wakefield; in the year 1756 he arrived in London. While on the Continent he subsisted chiefly by a little skill in music, which made him acceptable to the peasantry; but he often met with a kind reception at the religious houses, where his genius and learning were much esteemed. On his return to England, he was in such low circumstances that it was long before he could get employment in London, being rejected by several apothecaries to whom he offered himself as a journeyman. He was at last taken into a laboratory, and shortly after met with a Dr. Sleigh, who now afforded him aid till something better could be done for him. By degrees he rose into fame from his poems, dramatic writings, and novels, and might have acquired a competency, but that he was lavish of his money and addicted to gaming, which constantly kept him poor. In the latter part of his life he was afflicted with a stranguary, and fell into an habitual despondency. He died in April, 1774, and was buried in Westminster abbey, where there is a monument to his memory, with an elegant epitaph, written by his friend Dr. Johnson.

As to his character, it is strongly illustrated by Mr. Pope's line, "In wit a man, simplicity a child." The learned leisure he loved to enjoy was too often interrupted by distresses which arose from the liberality of his temper, and which sometimes threw him into loud fits of passion: but this impetuosity was corrected upon a moment's reflection; and his servants have been known, upon these occasions, purposely to throw themselves in his way, that they might profit by it immediately after; for he who had the good fortune to be reproved was certain of being rewarded for it. The universal esteem in which his poems were held, and the repeated pleasure they give in the perusal, is a striking test of their merit. He was a studious and correct observer of nature; happy in the selection of his images; in the choice of his subjects, and in the harmony of his versification; and though his embarrassed situation prevented him from putting the last hand to many of his productions, his Hermit, his Traveller, and his Deserted Village, decidedly claim a place among the finished pieces in the English language.

Besides the works already mentioned, he wrote, 1. History of the Earth and Animated Nature, 6 vols. 8vo. 2. History of England, 4 vols. 8vo. 3. History of Rome, 2 vols. 4. Abridgments of the two last, for the use of schools. 5. A View of Experimental Philosophy, 3 vols. 8vo.; a posthumous work, not much esteemed. 6. Miscellanies. 7. The Citizen of the World. 8. The Good natured Man, a comedy. 9. She Stoops to Conquer, a comedy.

GOLDY LOCKS, in botany. See Chrysocoma.

GOLF, Goff, or Gouf, an ancient English and Scotch game, and still common to the latter country, in which clubs are used for striking balls, stuffed very hard with feathers, from one hole to another. He who drives his ball into the hole with the fewest strokes is the winner.

The derivation of the word golf or goff has been differently given by the etymologists. Skinner deduces it from the Latin *colaphus*, a blow: Pinkerton proposes the Scandinavian golf, pavimentum, from its being played on level fields; others, with more probability, from the German *kolbe*, a club; whence the Dutch and Swedish kolf of the same meaning. This is farther confirmed by the fact that gouf, in the Scottish dialect, still means a blow or stroke; and that the Dutch still follow the game of golf under the denomination of colf, which they play in an inclosed area, in which are placed two circular posts, each of them about eight or ten feet from each end wall: "and the contest is who shall hit the two posts in the fewest strokes, and make his ball retreat from the last one with such an accurate length as that it shall be nearest to the opposite end wall of the area." *Statist. Acc.* (*Inveresk.*) xvi. 23.|30. N.

Golf seems to have been an improvement upon foot-ball, in the same manner perhaps as cricket has been an improvement upon golf. In Scotland it occupied so much of the time of the common people, in conjunction with foot-ball, and similar sports, as to have rendered a prohibition absolutely necessary in the reign of James IV: for we find it formally enacted by the parliament of 1491, "that in na place of the realme thair be usit fut-ballis, golf, or uther sic unprofitabill sportis for the commoun gude of the realme and defence thairof."

In England, golf (according to Strutt), was practised in the reign of Edward III. under the Latin name cambuca, which was given it, no doubt, from the crooked club or bat with which it was played: the bat was also called by the common people a bandy, from its being bent; whence the game itself is frequently written in English bandy-ball. —Sports and Pastimes, p. 81.

As the game is now usually played, the club employed is taper, progressively diminishing towards the part that strikes the ball, which part is faced with horn and loaded with lead. There are six sorts of clubs used by good players; namely, the common club, used when the ball lies on the ground; the scraper, and half-scraper, when in long grass; the spoon, when in a hollow; the heavy iron club, when it lies deep among stones or

mud; and the light iron ditto, when on the surface of chingle or sandy ground. The balls are considerably smaller than those used at cricket, but much harder; being made of horse leather, stuffed with feathers in a peculiar manner, and boiled.

The ground may be circular, triangular, or a semicircle. The number of holes are not limited; always depending on what the length of the ground will admit. The general distance between one hole and another is about a quarter of a mile, which commences and terminates every game; and the party who get their ball in by the fewest number of strokes are the victors.

Two, or as many as choose, may play together; but what is called the good game never exceeds four; that number being allowed to afford best diversion, and not so liable to confusion as a greater number. The more rising or uneven the ground, the greater nicety or skill is required in the players; on which account such is always given the preference to by proficients.

Light balls are used when playing with the wind, and heavy ones against it. At the beginning of each game the ball is allowed to be elevated to whatever height the player chooses, for the convenience of striking; but not afterwards. This is done by means of sand or clay, called a teeing. The balls which are played off at the beginning of the game must not be changed till the next hole is won, even if they should happen to burst. When a ball happens to be lost, that hole is lost to the party; and if a ball should be accidentally stopped, the player is allowed to take his stroke again.

Suppose four are to play the game, A and B against C and D; each party having a ball, they proceed thus: A strikes off first; C next, but perhaps does not drive his ball above half the distance A did, on which account D, his partner, next strikes it, which is called one more, to get it as forward as that of their antagonists, or as much beyond it as possible; if this is done, then B strikes A's ball, which is called playing the like, or equal, of their opponents. But if C and D, by their ball being in an awkward situation, should not be able, by playing one more, to get it as forward as A's, they are to play in turn, two, three, or as many more, until that is accomplished, before B strikes his partner's ball: which he calls one to two, or one to three, or as many strokes as they required to get to the same distance as A did by his once playing. The ball is struck alternately, if the parties are equal, or nearly so.

A club of gentlemen from London meet at the Green Man, Blackheath, every Saturday, when the weather is favourable, and play at golf on the heath, a piece of ground peculiarly fitted for the pastime.

GOLIUS (James), a learned Orientalist, was born at the Hague in 1596. Having finished his education at Leyden, he travelled with the duchess de la Tremouille into France, and in consequence of an invitation he taught the Greek language a short time at Rochelle. On his return to Holland, he became the intimate friend of Erpenius, at that time Arabic professor at Leyden. In 1622 he went with the Dutch ambassador to the court of Muley Zidan, emperor of Morocco, taking with him a letter from Erpenius to that prince, together with a present of a grand atlas, and an Arabic translation of the New Testament. Golius returned from the journey with great acquisition to his knowledge in the Arabic, and with many books unknown in Europe. On the death of Erpenius, he succeeded to the Arabic professorship at Leyden. In 1625 he went to the Levant, and made excursions into Arabia; and in 1629 he returned to his native country, with a perfect knowledge of the Persian, Turkish, and Arabic tongues, and laden with manuscripts that have ever since been the boast of the university of Leyden. In his absence he had been chosen professor of mathematics in that university, and after his return was appointed interpreter to the states for the eastern languages. He published an Arabic lexicon; a new edition of Erpenius's grammar; and several pieces of Arabic poetry. This great man died in 1667, universally lamented.

GOLL. *s.* Hands; paws: obsolete (*Sidney*).

GOLNAW, a town of Prussian Pomerania, seated on the Ilna. Lat. 53. 46 N. Lon. 14. 59 E.

GOLTZIUS (Henry,) a painter and engraver, was born in 1558 at Mulbrec, in the duchy of Juliers. He travelled through Germany and Italy in a curious disguise, having with him a servant who passed for master, while he appeared as a servant kept by the other merely for his skill in painting. From this journey he derived great pleasure and improvement. He died at Haerlem in 1617. His execution as an engraver was highly esteemed.

GOMBAULD (John Ogier de,) one of the best French poets in the 17th century, and one of the first members of the French academy, was born at St. Just de Lussac. He acquired the esteem of Mary de Medicis, and of the wits of his time. He was a Protestant, and died in a very advanced age. He wrote many works in verse and prose. His epigrams, and some of his sonnets, are particularly esteemed. He died in 1666, at the great age of 92 years.

GOMBROON, a considerable seaport of Persia, in the province of Farsistan. It is called by the natives Bandar Abassi, and is seated on a bay, 12 miles N. of the E. end of the island of Kismish, and nine miles from the famous island of Ormus. The best houses are built of brick dried in the sun, and stand close to each other, being flat at the top, with a square turret, having holes on each side for the free passage of the air. Upon these roofs, those that stay in the town sleep every night in the summer season. The common people have wretched huts, made with

the boughs of palm-trees, covered with leaves. The streets are narrow and irregular. The English and Dutch have factories here, which is a great advantage to the trade of the place. Lat. 27. 28 N. Lon. 56. 30 E.

GOME. *s.* The black grease of a cart-wheel.

GOMERA, one of the Canary islands lying between Ferro and Teneriffe. It has one good town of the same name, with an excellent harbour, where the Spanish fleet often take in refreshments. They have corn sufficient to supply the inhabitants, with one sugar-work, and great plenty of wine and fruits. It is subject to the Spaniards. Lat. 28. 6 N. Lon. 17. 3 W.

GOMORRAH, in ancient geography, one of the cities of the plain or of the vale of Siddim in Judea, destroyed together with Sodom, by fire from heaven, on account of the wickedness of the people.

GO'MPHIA. In botany, a genus of the class decandria, order monogynia. Calyx five-leaved; petals five; anthers nearly sessile; drupes from two to five; one-seeded; inserted on a roundish fleshy receptacle. Five species; native trees of the East or West Indies.

GOMPHOLO'BIUM. In botany, a genus of the class decandria, order monogynia. Calyx campanulate, simple, five-parted; corol papilionaceous; stigma simple, acute; legume ventricose, one-celled, many-seeded. One species only; an Australasian shrub with the leaves ternate or unevenly pinnate.

GOMPHOSIS. (*gomphosis*, γομφωσις; from γομφοω, to drive in a nail). In anatomy, a species of synarthrosis, or immoveable connexion of bones, in which one bone is fixed in another, like a nail in a board, as the teeth in the alveoli of the jaws.

GOMPHRE'NA. Globe amaranth. In botany, a genus of the class pentandria, order digynia. Calyx coloured; the outer three-leaved; two of the leaves connivent, carinate; petals five rude, villous; nectary cylindrical, five-toothed; capsule one-seeded; style half bifid. Ten species, scattered over the warm climates of Asia, Africa, and America.

The only species in common cultivation in our own gardens is G. globosa, with erect stem; leaves ovate-lanceolate; heads solitary; peduncles two-leaved. There are two varieties of it, one with a large head of fine bright purple flowers; the other with a head of white or silver-hued. Both are propagated by seeds, which should be sown on a hot-bed the beginning of March. When the plants are come up about half an inch high, they should be transplanted on a fresh hot-bed, at about four inches distance, observing to shade them till they have taken root: they should have fresh air admitted to them every day, in proportion to the warmth of the season, and be gently refreshed with water. In about a month's time a fresh hot-bed must be prepared, into which a sufficient number of pots, filled with light rich earth, should be plunged; and when the bed is in a proper temperature of warmth, the plants should be carefully taken up, with balls of earth to their roots; and each planted into a separate pot, observing to shade them till they have taken new root; and afterwards let them be treated as other tender exotic plants. When the plants have filled these pots with their roots they should be taken out, and their roots carefully pared off on the outside of the ball of earth; then they should be put into pots of a larger size. In July the plants should be gradually brought to bear the open air, into which they may be removed about the middle of the month, and intermixed with other annuals, to adorn the pleasure-garden. The several other species of this genus are all so tender that they seldom perfect their seeds in England; and being plants not very remarkable for their beauty, are cultivated in botanic gardens only for the sake of variety.

GONATO-CARPUS, in botany, a genus of the class tetrandria, order monogynia. Calyx-less; corol four-cleft; drupe inferior, eight-sided, one-seeded. One species, an annual plant of Japan, with small drooping spiked flowers.

GONAVE, an island of the West Indies, near the W. coast of St. Domingo. Lat. 18. 51 N. Lon. 73. 4 W.

GONDAR, a town of Africa, and capital of Abyssinia, situated on a hill of a considerable height, surrounded on every side by a deep valley. It consists of ten thousand families in time of peace: the houses are chiefly of clay, the roofs thatched in the form of cones, which is always the construction within the tropical rains. On the west end of the town is the king's house, formerly a structure of considerable consequence; it was a square building, flanked with square towers; it was formerly four stories high, and, from the top of it, had a magnificent view of all the country southward to the lake Tzana. Great part of this house is now in ruins, having been burnt at different times; but there is still ample lodging in the two lowest floors of it; the audience chamber being above 120 feet long. The palace, and all its contiguous buildings, are surrounded by a substantial stone wall, thirty feet high, with battlements upon the outer wall, and a parapet roof between the outer and inner, by which you can go along the whole, and look into the street. There appears to have never been any embrasures for cannon, and the four sides of this wall are above an English mile and a half in length. Lat. 12. 34 N. Lon. 37. 33 E.

GONDEGAMA, a river of the peninsula of Hindoostan, which rises near Combam, forms the nominal boundary of the Carnatic, on the north, and enters the bay of Bengal, at Mootapilly.

GONDI (John Francis Paul), Cardinal de Retz, was the son of Philip Emanuel de Gondi, Count de Joigny, lieutenant-general, &c. and was born in 1613. From a doctor of the Sorbonne, he first became coadjutor to his

uncle John Francis de Gondi, whom he succeeded in 1654 as archbishop of Paris; and was finally made a cardinal. This extraordinary person has drawn his own character in his memoirs with impartiality. He was a man who, from the greatest degree of debauchery, and long languishing under its consequences, made himself adored by the people as a preacher. At the age of 23, he was at the head of a conspiracy against the life of Cardinal Richelieu; he precipitated the parliament into cabals, and the people into sedition: he was (says M. Voltaire) the first bishop who carried on a civil war without the mask of religion. However, his intrigues and schemes turned out so ill, that he was obliged to quit France; and he lived the life of a vagrant exile for five or six years, till the death of his great enemy cardinal Mazarin, when he returned on certain stipulated conditions. After assisting in the conclave at Rome which chose Clement IX. he retired from the world, and ended his life like a philosopher in 1679; which made Voltaire say, that in his youth he lived like Catiline, and like Atticus in his old age. He wrote his Memoirs in his retirement; the best edition of which is that of Amsterdam, 4 vols. 12mo. 1719.

GONDOLA, a flat boat, very long and narrow; chiefly used at Venice to row on the canals. The word is Italian. Du Cange derives it from the vulgar Greek κονδηλας, a bark, or little ship. The middle sized gondolas are about 30 feet long, and 4 broad: they terminate at each end in a very sharp point, which is raised perpendicularly 5 or 6 feet.

Macgill, in his Travels in Turkey, Italy, &c. describes the gondolas in the following manner: "A gondola is a barge of considerable length, which from its peculiar construction sits very steady in the water. It is painted black by order of government, and has on its brow a piece of flat iron, highly polished, resembling the neck of a horse. The after part of the boat is several feet out of the water; and almost on the point of the stern stands the rower, who having from long practice acquired great dexterity, steers his gondola with one oar, with much exactness and velocity. I mention the one-oared gondola because I admire it the most, and think it by far more singular than any other. I never saw men stand and row so elegantly as the Venetian gondoliers. In the middle of the boat is a small place covered with black velvet, which much resembles a hearse; in the front of this is a curtain; at each side a window with Venetian blinds; and on the part next the stern is a cushion large enough for two people. Underneath each window is a stool, on a level with the cushion; so that the persons within are placed in a reclining posture. These gondolas will turn a corner at full speed, and it is very rarely that any accident happens to them. The rowers have certain expressions which they repeat to one another, in order to give warning of their approach, and which serve as a mutual direction which side of the canal they are to take."

GONDOLI'ER. *s.* (from *gondola*.) A boatman; one that rows a gondola (*Shaks.*).

GONE. part. preter. (from *go.*) 1. Advanced; forward in progress (*Swift*). 2. Ruined; undone (*Shakspeare*). 3. Past (*Shakspeare*). 4. Lost; departed (*Holder*). 5. Dead; departed from life (*Oldham*).

GONE AWAY, in sporting, the outcry or halloo from one sportsman to another in stag or fox-hunting, when the game is perceived to break from his coverts and go off; at which time if it were not for some such exclamation, those who happen to be up the wind would have a chance of being thrown out, and from their distance, not know any thing of the matter. To prevent this ill-luck, the person who first espies the animal instantly vociferates the signal; which is as quickly re-echoed by every one in succession, till it has reached and vibrates through the whole company. The chase then begins to be alive, and men, horses, and hounds all unite in rival ardour and spirit. See FOXHUNTING.

GO'NFALON, GO'NFANON. *s.* (*gonfanon*, French.) An ensign; a standard (*Mil.*).

GONJAH, a kingdom of Africa, between the coast of Guinea on the south, and Tombuctou on the north. Gonjah the capital is in Lat. 13. 20 N. Lon. 6. 10 W.

GOOD HOPE. See CAPE OF GOOD HOPE.

GONIOMETRY, a method of measuring angles, so called by M. de Lagny, who gave several papers, on this method, in the Memoirs of the Royal Acad. an. 1724, 1725, 1729. M. de Lagny's method of Goniometry consists in measuring the angles with a pair of compasses, and that without any scale whatever, except an undivided semicircle. Thus, having any angle drawn upon paper, to be measured; produce one of the sides of the angle backwards behind the angular point; then with a pair of fine compasses describe a pretty large semicircle from the angular point as a centre, cutting the sides of the proposed angle, which will intercept a part of the semicircle. Take then this intercepted part very exactly between the points of the compasses, and turn them successively over upon the arc of the semicircle, to find how often it is contained in it, after which there is commonly some remainder: then take this remainder in the compasses, and in like manner find how often it is contained in the last of the integral parts of the 1st arc, with again some remainder: find in like manner how often this last remainder is contained in the former; and so on continually, till the remainder become too small to be taken and applied as a measure. By this means he obtains a series of quotients, or fractional parts, one of another, which being properly reduced into one fraction, give the ratio of the first arc to the semicircle, or of the proposed angle to two right angles, or 180 degrees, and con-

sequently that angle itself in degrees and minutes.

Thus, suppose the angle BAC (fig. 6. Pl. 76.) be proposed to be measured. Produce BA out towards f; and from the centre A describe the semicircle $abcf$, in which ab is the measure of the proposed angle. Take ab in the compasses, and apply it four times on the semicircle, as at b, c, d, and e; then take the remainder fe, and apply it back upon ed, which is but once, viz. at g; again take the remainder gd, and apply it 5 times on ge, as at h, i, k, l, and m; lastly, take the remainder me, and it is contained just 2 times in ml. Hence the series of quotients is 4, 1, 5, 2; consequently the 4th or last arc em is $\frac{1}{2}$ the third ml or gd, and therefore the 3d arc gd is $\frac{1}{5\frac{1}{2}}$ or $\frac{2}{11}$ of the 2d arc ef; and therefore again this 2d arc ef is $\frac{1}{1\frac{2}{11}}$ or $\frac{11}{13}$ of the 1st arc ab; and consequently this 1st arc ab is $\frac{1}{4\frac{11}{13}}$ or $\frac{13}{63}$ of the whole semicircle af. But $\frac{13}{63}$ of 180° are $37\frac{1}{7}$ degrees, or $37^{\circ}\ 8'\ 34''\frac{2}{7}$, which therefore is the measure of the angle sought. When the operation is nicely performed, this angle may be within 2 or 3 minutes of the truth; though M. de Lagny pretends to measure much nearer than that.

It may be added, that the series of fractions forms what is called a continued fraction. Thus, in the example above, the continued fraction, and its reduction, will be as follow:

$$\cfrac{1}{4+\cfrac{1}{1+\cfrac{1}{5\frac{1}{2}}}} = \cfrac{1}{4+\cfrac{1}{1\frac{2}{11}}} = \frac{1}{4\frac{11}{13}} = \frac{13}{63};$$

the quotients being the sucessive denominators, and 1 always for each numerator. (*Hutton's Dict.*)

GONIUM, in zoology, a genus of the class vermes, order infusoria. Worm very simple, flat, angular, invisible to the naked eye. Five species. Found on dunghills, or in stagnant waters, and two of them in pure waters: of which last the following is the more common:

G. pectorale. Quadrangular, pellucid, with sixteen spheroidal molecules: the molecules oval, nearly equal in size; set in a quadrangular membrane like diamonds in a ring, the lower ones a little larger than the rest.

GONORRHŒA. (*gonorrhœa*, γονοῤῥοια; from γονη, semen, and ῥεω, to flow; from an erroneous supposition of the ancients that it was a seminal flux.) A preternatural flux from the urethra or vagina. It arises from the action of the venereal virus on those parts, producing first an itching, afterwards a discharge like pus, attended with heat on making water; and in men is occasionally accompanied with phymosis, and sometimes paraphymosis.

GOOD. *a.* comp. *better*; superl. *best*. (*ʒod*, Saxon; *goed*, Dutch.) 1. Having such physical qualities as are expected or desired; not bad; not evil (*Dryden*). 2. Proper; fit; convenient (*Bacon*). 3. Uncorrupted; undamaged (*Locke*). 4. Wholesome; salubrious (*Prior*). 5. Medicinal; salutary (*Bacon*). 6. Pleasant to the taste (*Bacon*), 7. Complete; full (*Addison*). 8. Useful; valuable (*Coll.*) 9. Sound; not false; not fallacious (*Atterb.*). 10. Legal; valid; rightly claimed or held, 11. Confirmed; attested; valid (*Smith*). 12. Well qualified; not deficient (*Locke*). 13. Skilful; ready; dexterous (*South*). 14. Happy; prosperous (*Psalms*). 15. Honourable (*Pope*). 16. Cheerful; gay (*Pope*). 17. Considerable; not small though not very great (*Bacon*). 18. Elegant; decent; delicate; with breeding (*Addison*). 19. Real; serious; not feigned (*Shakspeare*). 20. Rich; able to fulfil engagements (*Shakspeare*). 21. Religious; virtuous; pious (*Matthew*). 22. Kind; soft; benevolent (*Sidney*), 23. Favourable; loving (*Samuel*). 24. Companionable; sociable; merry (*Clar.*). 25. Hearty; earnest; not dubious (*Sidney*). 26. *In* GOOD *time*. Not too fast (*Collier*). 27. *In* GOOD *sooth*. Really; seriously (*Shakspeare*). 28. *To make* GOOD. To keep; to maintain; not to give up; not to abandon (*Dryden*). 29. *To make* GOOD. To confirm; to establish (*Smalridge.*) 30. *To make* GOOD. To perform (*Waller*). 31. *To make* GOOD. To supply (*L'Estrange*).

GOOD. *s.* 1. That which physically contributes to happiness; benefit; advantage; the contrary to evil (*Shakspeare*). 2. Prosperity; advancement (*Ben Jonson*). 3. Earnest; not jest (*L'Estrange*). 4. Moral qualities, such as are desirable; virtue; righteousness; piety (*South*).

GOOD, in metaphysics, or metaphysical good, called also absolute or real good, and good *per se*, is the essential perfection or integrity of a thing, whereby it has every thing that belongs to its nature.

In this sense, all things that are are good, inasmuch as they have the perfections naturally belonging to things of their kind. Thus, a thinking substance is good or perfect, as it has all the essential attributes of thought; so an extended substance is good, as it possesses all the parts necessary to constitute it such.

GOOD (Physical or natural), is that whereby a thing possesses all things necessary to its *bene esse*, i. e. its well-being, or second perfection, and to the performance of its functions and uses.

In this sense, physical goodness coincides with physical perfection.

To this are required the several powers and faculties, in their proper degree; a due situation, figure, and proportion of parts, &c.

Note, beside absolute physical goodness, there may be a relative one; as in foods, which to one are salutary, to another poison, &c. To this head also belong the things

good pro tempore, or according to circumstances; as the amputation of a mortified limb, &c.

Good (Moral or ethical), is the agreement of a thinking, reasonable being, and of the habits, acts, and inclinations thereof with the dictates of right reason, and the will of the Creator, as discovered by natural light. See Virtue.

Good (Chief, sovereign, or supreme), *summum bonum*, is that, the enjoyment of which renders men truly and completely happy. The schools distinguish this chief good of man into that which is simply and adequately so, and beyond which there can be no other; and an inferior, subordinate kind, which is, in some measure, attainable in this imperfect state. This last they call *felicitas viatorum*, and the former *felicitas comprehensorum*. The chief or sovereign good, according to the idea collected of it from the original, natural, and universal preconceptions of all mankind, is something agreeable to our nature, conducive to well-being, accommodated to all places and times, durable, self-derived, and indeprivable; and this consists, says Mr. Harris, in rectitude of conduct, or in living perpetually selecting, as far as possible, what is congruous to nature, and rejecting what is contrary, making our end that selecting and rejecting only.

An excellent writer lays down the following *criteria* or characteristics of the *summum bonum*, or chief good, which reason can demonstrate to be actually designed for man: it is something which all men, if not wanting to themselves, may be possessed of; it is one and the same to all mankind; and while in itself fitted to make the possessor happy, is not prevented in its operation by some other thing which keeps him from relishing it: and as to the highest good which it is possible for man to enjoy, it must be referred to no other, but all others must be embraced for the sake of this; and it must be sufficient to furnish a happiness adequate to the capacities of human nature, and of equal duration; i. e. it must be not only perfect whilst it lasts, but everlasting. According to these characters we may infer, that neither the goods of fortune, nor those of the body, nor even virtue itself, constitute the chief good. Virtue rightly understood is the perfection of human nature; it is the instrument of obtaining happiness: but this alone will not make a man happy; it is farther necessary that he be perfect as to life, or happy in the circumstances of his being: and, therefore, natural reason demonstrates, that the favour of God, secured by virtue, is properly man's supreme good. Grove's System of Moral Philosophy, vol. i. part 1. passim.

Good. *ad.* 1. Well; not ill; not amiss. 2. *As* Good. No worse.

Good. *interj.* Well; right.

Good-conditioned. *a.* Without ill qualities or symptoms (*Sharp*).

Good Henry, in botany. See Chenopodium.

Good Hope (Cape of). See Cape.

GOODIA, in botany, a genus of the class diadelphia, order decandria. Upper lip abbreviated, two-toothed, lower three-toothed and broader; keel of the corol truncated; legume pedicelled, gibbous at the back, two-seeded; stigma capitate. One species, G. lotifolia, lotus-leaved goodia; a hardy green-house shrub, of handsome growth; flowers in May, June and July; is propagated by seeds and cuttings.

It is a native of New South Wales, and derives its appellation from a botanist of the name of Peter Good, whose love of plants induced him to leave a lucrative employment and repair to this remote colony to collect seeds for his majesty, in which service he died. See Nat. Hist. Plate CXXV.

GOOD-NOW. *interjection.* 1. In good time: a low word (*Shakspeare*). 2. A soft exclamation of wonder (*Dryden*).

GO'ODLINESS. *s.* (from *goodly.*) Beauty; grace; elegance (*Sidney*).

GO'ODLY. *a.* (from *good.*) 1. Beautiful; graceful; fine; splendid. 2. Bulky; swelling; affectedly turgid (*Dryden*). 3. Happy; desirable; gay (*Spenser*).

Go'odly. *ad.* Excellently: obsolete (*Spenser*).

GO'ODLIHOOD. *s.* (from *goodly.*) Grace; goodness: obsolete (*Spenser*).

GO'ODMAN. *s.* (*good* and *man.*) 1. A slight appellation of civility (*Shakspeare*). 2. A rustick term of compliment; gaffer (*Gay*).

GO'ODNESS. *s* (from *good.*) Desirable qualities either moral or physical; kindness; favour (*Hooker*).

GOODS. *s.* (from *good*). 1. Moveables in a house (*Chapman*). 2. Personal or moveable estate (*Shakspeare*). 3. Wares; freight; merchandise (*Raleigh*).

GO'ODY. *s.* (corrupted from *good wife.*) A low term of civility used to mean persons (*Gay*).

GO'ODYSHIP. *s.* (from *goody.*) The quality of a goody (*Hudibras*).

GOOGINGS, in naval affairs, certain clamps of iron or other metal, bolted on the stern-post, on which to hang the rudder; for this purpose there is a hole in each of them to receive a correspondent spindle, bolted on the back of the rudder, which turns thereby as on hinges. There are several googings on a ship's posts and rudder, according to her size, and on these the rudder is supported and traverses.

GOOLE, in law books, signifies a breach in a sea-bank, or wall.

GOOMPTY, a river in Hindoostan Proper, which rises in the Rohilla country, and flowing S. E. by Lucknow and Joinpour, falls into the Ganges a little below Benares.

GOOSANDER, in ornithology. See Mergus.

GOOSE, in ornithology. See Anas.

Goose, is also a name given to a tailor's smoothing iron.

GOOSEBERRY TREE. See Ribes.

Gooseberry (American). See Melastoma.

Gooseberry, of the Americans, and Barbadoes. See Cactus.

GO'RBELLIED. *a.* (from *gorbelly*.) Fat; big-bellied (*Shakspeare*).

GO'RBELLY. *s.* (from ᵹoꞃ, dung, and *belly*.) A big paunch; a swelling belly.

GORCUM, a town of the United Provinces, in Holland, which carries on a considerable trade in cheese and butter. Lat. 51°. 51 N. Lon. 4°. 51 E.

GORDE'NIA. In botany, a genus of the class pentandria, order monogynia. Corol longitudinally cloven on the upper side, exposing the organs of fructification; the border five-cleft; leaning one way; anthers linear, beardless; stigma cup-shaped, ciliate; capsule two-celled, two-valved; many-seeded; with a parallel partition. Ten species; shrubs of New Holland. See Nat. Hist. Pl. CXXXII.

GORDIAN-KNOT. See Gordius.

GORDIANUS (M. Antoninus Africanus), a son of Metius Marcellus, descended from Trajan, by his mother's side, was an example of piety and virtue. He composed a poem in thirty books upon the virtues of Titus Antoninus, and M. Aurelius. Having been promoted to the pretorship, he was sometime after elected consul, and went to take the government of Africa in the capacity of proconsul. After he had attained his eightieth year, in the greatest splendor, and domestic tranquillity, he was roused from his peaceful occupations by the tyrannical reign of the Maximini, and he was proclaimed emperor by the rebellious troops of his province. He long declined to accept the imperial purple, but the threats of immediate death gained his compliance. Maximinus marched against him with the greatest indignation; and Gordian sent his son, with whom he shared the imperial dignity, to oppose the enemy. Young Gordian, who was of an amiable disposition, was killed in a bloody battle the 25th of June, A. D. 236; and the father, worn out with age, and grown desperate on account of his misfortunes, strangled himself at Carthage, before he had been six weeks at the head of the empire, A. D. 236. He was universally lamented by the army and people. —2. M. Antoninus Pius, grandson of the first Gordian, was but twelve years old when he was honoured with the title of Cæsar. He was proclaimed emperor in the sixteenth year of his age, and his election was attended with universal marks of approbation. In the eighteenth year of his age, he married Furia Sabina Tranquillina, daughter of Misitheus, a man celebrated for his eloquence and public virtues. He entrusted his father-in-law with the most important offices, in the execution of which he corrected the various abuses which prevailed in the state, and restored the ancient discipline among the soldiers. Gordian conquered Sapor, king of Persia, who had invaded the Roman provinces, and took many flourishing cities in the east from his adversary. In this success the senate decreed him a triumph, and saluted Misitheus as the guardian of the republic. Gordian was assassinated in the east, A. D. 244, by the means of Philip, who usurped the sovereign power by murdering a warlike and amiable prince. During the reign of Gordianus, there was an uncommon eclipse of the sun, in which the stars appeared in the middle of the day.

GORDIUS, a Phrygian, who, though originally a peasant, was raised to the throne, in consequence of an oracle given to the Phrygians, which recommended to them to give the crown to the first man they met going to the temple of Jupiter, mounted on a chariot. The famous Gordian knot took its origin from this chariot. The knot which tied the yoke to the draught tree was made in such an artful manner, that the ends of the cord could not be perceived. From this circumstance, a report was soon spread that the empire of Asia was promised by the oracle to him who could untie the Gordian knot. Alexander, in his conquest of Asia, passed by Gordium; and as he wished to inspire his soldiers with courage and make his enemies believe that he was born to conquer Asia, he cut the knot with his sword; and asserted that the oracle was really fulfilled, and that his claims to universal empire were fully justified.

Gordius. Hair-worm. In zoology, a genus of the class vermes, order intestina. Body round, filiform, equal, smooth. Five species: as follow.

1. G. aquaticus. Pale bown, with dark extremities. Inhabits soft stagnant waters; from four to six inches long; wists itself into various contortions and knots, and if incautiously handled, will inflict a bite at the the end of the fingers, and occasion the complaint called a whitlow. It is vulgarly supposed to be produced by horse-hairs, accidentally dropped into the water. See Nat. Hist. Pl. CXXX.

2. G. argillaceus. Body uniformly yellowish. Found in clay at the body of stagnant waters, which it pierces through; and is hardly distinguishable from the last.

3. G. filum. Body filiform, whitish and hyaline. Found in the bark of old wooden pipes, which have been placed in the ground for the purpose of conveying streams of water; is extremely slender, and a little tapering at the end.

4. G. lacteus. Body uniformly white, and opake. Found in stagnant waters; when touched contracts itself for a moment, and afterwards extends.

5. G. arenarius. Body fulvous and obtuse. Inhabits the sandy bottom of Christian's Bay, in Norway. The filiaria medinensis or Guinea worm has often been confounded with this genus: the reader will perceive the difference by turning to Filiaria.

GORDON (Thomas), a political writer, was a native of Scotland. He was concerned with Trenchard in a periodical paper, called Cato's Letters, published in 1720, and afterwards in another, entituled, The Independent Whig, which Gordon continued for some time

after the death of Trenchard. Sir Robert Walpole at length took Gordon into pay, to defend his administration, and made him commissioner of the wine licences. He died in 1750. Gordon translated Tacitus into English.

GORDON (Alexander), M. A. a Scotch writer and antiquary. He was successively secretary to the society for encouragement of learning, the Egyptian club, and the antiquarian society. He went to Carolina, with governor Glen, where he died.

GORDON (The hon. George), commonly called lord George Gordon, was the son of Cosmo George duke of Gordon, and born in 1750. He entered into the navy when young, but quitted it on account of some dispute with lord Sandwich. He afterwards sat in parliament for Ludgershall, and distinguished himself by some strange speeches against the king and his ministers. But what chiefly brought him into notice was his opposition to the bill for granting farther toleration to Roman Catholics. His intemperance on this occasion proved the cause of the shameful riots in 1780, for which he was tried and acquitted. In 1786 he was excommunicated for not appearing as a witness in some cause. In 1788 he was found guilty of publishing a libel against the queen of France, on which he fled to Holland. Some time after he returned to England, and was taken in the disguise of a Jew, which profession he had adopted, and was committed to Newgate, where he died in 1793.

GORDO'NIA. Loblolly bay. In botany, a genus of the class monadelphia, order polyandria. Calyx single; style five-sided, with a five-cleft stigma; capsule five-celled, seeds two, with a foliaceous wing on one side. Four species. Trees and shrubs of the West Indies, or Carolina. The following are chiefly worthy of notice.

1. G. lasianthus, with downy calyx villous at the edge; yellow flowers, on long peduncles; leaves coriaceous, glabrous; capsules ovate. The leaves are evergreen; the tree, which is tall and straight, begins to blossom in May, and continues to blossom through the whole of summer.

2. G. Franklini. A shrub indigenous, also, to Carolina, twenty feet high; with oblong serrate, glabrous leaves; flowers sessile axillary, white; with the petals curled; and fruit globular.

GORE, in heraldry, one of the abatements, which, according to Guillim, denotes a coward. It is a figure consisting of two arch lines drawn one from the sinister chief, and the other from the sinister base, both meeting in an acute angle in the middle of the fess point.

GORE. *s.* (ȝoɲe, Saxon.) 1. Blood effused from the body (*Spenser.*) 2. Blood clotted or congealed (*Milton*).

To GORE. *v. a.* (ȝebeɲian, Saxon.) 1. To stab; to pierce (*Shakspeare.*) 2. To pierce with a horn (*Dryden*).

GORE ISLAND, a place discovered by Captain Cook, in his last voyage. Lat. 64. 0 N. Lon. 169. 0 W.

GOREE, a small barren island extending about three quarters of a mile in length, of a triangular form. It belongs to the French. Lat. 14. 40 N. Lon. 17. 25 W.

GOREE, a town of Holland. Lat. 51. 40 N. Lon. 4. 20 E.

GORGE, in architecture. 1. The narrowest part of the Tuscan and Doric capitals, lying between the astragal and the annulets. 2. A concave moulding, wider than the Scotia, but not so deep. 3. The neck of a column. 4. The throat of a chimney, or the part between the chambranle and the crowning of the mantle.

GORGE, in fortification, the entrance of the platform of any work. See FORTIFICATION.

In all the outworks, the gorge is the interval betwixt the wings on the side of the great ditch, as the gorge of a ravelin, half-moon, &c. These, it is to be observed, are all destitute of parapets; because if there were any, the besiegers, having taken possession of the work, might use it to defend themselves from the shot of the place; which is the reason that they are only fortified with palisadoes, to prevent a surprise.

The gorge of a bastion is nothing but the prolongation of the curtins from their angle with the flanks, to the centre of the bastion where they meet. When the bastion is flat, the gorge is a right line, which terminates the distance between the two flanks.

GORGE. *s.* (*gorge*, French.) 1. The throat; the swallow (*Sidney.*) 2. That which is gorged or swallowed (*Spenser*).

To GORGE. *v. n.* (*gorger*, French.) 1. To fill up to the throat; to glut; to satiate (*Add.*) 2. To swallow: as, the *fish has* gorged *the hook*.

GORGED, in heraldry, the bearing of a crown, coronet, or the like, about the neck of a lion, a swan, &c. and in that case it is said, the lion or cygnet is gorged with a ducal coronet, &c. Gorged is also used when the gorge, or neck of a peacock, swan, or the like bird, is of a different colour or metal from the rest.

GORGED, among farriers, denotes any diffused swelling about a horse; but chiefly in his legs, occasioned rather by severe and hard work, than the effect of humours originating in a sizey or morbid state of the blood. A horse having his back sinews flushed, and legs thickened, so as to go short and stiff in action, but not broken down, is said to be gorged. Having the same appearances from humours, or a viscidity of the blood, he is said to be foul, and must be relieved by purgatives or diuretics, assisted by much hand-rubbing and other friction. Gorged horses should be blistered, and turned out in time, by which they frequently get fresh again: continued at work too long, they break down, and become cripples.

GO'RGEOUS. *a.* (*gorgias*, old French.) Fine; glittering in various colours; showy; splendid; magnificent (*Milton*).

GO'RGEOUSLY. *ad.* Splendidly; magnificently; finely (*Wotton*).

GO'RGEOUSNESS. *s.* Splendour; magnificence; show.

GO'RGET. *s.* (from *gorge.*) The piece of armour that defends the throat (*Knolles*).

GORGERIN, in architecture, the little freize in the Doric capital.

GORGONA, a small island of the Tuscan Sea, remarkable for its anchovy fishery. Lat. 43. 22 N. Lon. 10. 0 E.

GORGONA, a small island of the South Sea, about twelve miles W. of the coast of Peru. Lat. 3. 20 S. Lon. 77. 50 W.

GORGO'NIA. In zoology, a genus of the class vermes, order zoophyta. Animal growing in the form of a plant; stem coriaceous, corky, woody, horny, or bony, composed of glassy fibres, or like stone, striate, tapering, dilated at the base, covered with a vascular or cellular flesh or bark, and becoming spongy and friable when dry; mouths or florets covering the surface of the stem, and polype-bearing. Forty-one species, found in different parts of the globe; of which four or five are inhabitants of the coasts or seas of our own country. The following are chiefly entitled to notice.

1. G. lepadifera. Dichotomous, with crowded, imbricate, reflected, companulate mouths or florets. Inhabits the Norway Seas: nearly two feet high: flesh pale, covered with minute whitish scales; florets covered with white, imbricate scales, and have the appearance of small bernacles; stem white, with a stony base, and cartilaginous branches.

2. G. nobilis. Red coral, with outspread, irregular, slightly tapering branches; flesh red, soft, slippery, and full of minute pores; bone stony, bright red, and irregularly striate. Inhabits the Mediterranean and Red Seas; is very beautiful and valuable, and grows to about a foot in height: the pores or florets are irregularly placed, and a little prominent, consisting of eight valves, from which the polypes proceed, possessed of eight tentacles. This is the best and finest of our corals; for others of an inferior quality, see ISIS.

3. G. flabellum. Venus's fan. Reticulate, with the branches compressed on the inner side; bark yellow, or purplish; bone black, horny, and slightly striate on the larger branches. Inhabits most seas: found about our own coasts; is often several feet high, and expanded into a large surface; flexile, horny, black; the older bark whitish or grey; pores irregularly placed, but generally in the form of a quincunx: trunk and branches pinnate, and by means of the smaller branches blending together, and forming an elegant kind of network: polypes with eight claws. See Nat. Hist. Pl. CXXII.

GORGONS, in antiquity and mythology. Authors are not agreed in the account they give of the Gorgons. The poets represent them as three sisters, whose names were Stheno, Euryale, and Medusa; the latter of whom was mortal, and, having been deflowered by Neptune, was killed by Perseus; the two former were subject neither to age nor death. They are described with wings on their shoulders, with serpents round their heads, their hands were of brass, and their teeth of a prodigious size, so that they were objects of terror to mankind. After the death of Medusa, her sisters, according to Virgil, were appointed to keep the gate of the palace of Pluto.

Multaque præterea variarum monstra ferarum—
GORGONES, *Harpeiæque*———

Diodorus Siculus will have the Gorgons and Amazons to have been two warlike nations of women, who inhabited that part of Lidya which lay on the lake Tritonidis. The extermination of these female nations was not effected till Hercules undertook and performed it. Others represent them as a kind of monstrous women, covered with hair, who lived in woods and forests. Others again make them animals, resembling wild sheep, whose eyes had a poisonous and fatal influence.

GORITZ, the capital of a country of the same name in the duchy of Carniola, with a castle. Lat. 46. 20 N. Lon. 13. 30 E.

GORLITZ, a strong and handsome town of Germany, in Upper Lusatia, on the river Neisse. Lat. 51. 10 N. Lon. 15. 40 E.

GO'RMAND. *s.* (*gourmand*, French.) A greedy eater; a ravenous luxurious feeder.

To GO'RMANDIZE. *v. n.* (from *gormand.*) To feed ravenously; to eat greedily.

GORMANDI'ZER. *s.* (from the verb.) A voracious eater.

GORSE. *s.* (ᵹoɲʃ, Saxon.) Furz, a thick prickly shrub, that bears yellow flowers. See ULEX.

GORTERIA, in botany, a genus of the class syngenesia, order polygamia frustranea. Receptacle naked; down woolly; florets of the ray ligulate; calyx one-leafed; clothed with imbricate scales. Seven species, all shrubs of the Cape: there are other plants, and especially of the genera russinia and berckheya, which have at times been erroneously introduced as species of gorteria; but which are here restored to their proper stations.

GO'RY. *a.* (from *gore.*) 1. Covered with congealed blood (*Spencer.*) 2. Bloody; murderous; fatal (*Shakspeare*).

GO'SHAWK. *s.* (ᵹoʃ, goose, hafoc, a hawk.) A hawk of a large kind. See FALCO.

GOSHEN, in ancient geography, a canton of Egypt, which Joseph procured for his father and his brethren, when they came to dwell in Egypt. This country lay between Palestine and the city of Tanais, and the allotment of the Hebrews reached southward as far as the Nile.

GOSLAR, a town of Lower Saxony, in Germany, where it is supposed gunpowder was first invented by a monk. It is 28 miles S. of Brunswick. Lat. 52. 0 N. Lon. 10. 42 E.

GO'SLING. *s.* (from *goose*.) 1. A young goose; a goose not yet full grown (*Swift*). 2. A catkin on nut-trees and pines.

GOSPEL, a history of the life, actions, death, resurrection, ascension, and doctrine of Jesus Christ.

The word is Saxon, and of the same import with the Latin term *evangelium*, or the Greek *ευαγγελιον*, which signifies glad tidings, or good news, or good message; the history of our Saviour being the best history ever published to mankind. This history is contained in the writings of St. Matthew, St. Mark, St. Luke, and St. John; who from thence are called Evangelists. The Christian church never acknowledged any more than these four gospels as canonical, notwithstanding which, several apocryphal gospels are handed down to us, and others are entirely lost.

The word gospel is also used to denote the doctrines peculiar to the Christian religion, or those which point out the way by which man, as a fallen and rebellious creature, may be restored to the image and favour of his Maker, may be, "created anew unto holiness," though Christ Jesus, and thus be, "made meet for the inheritance of the saints in light."

To GOSPEL. *v. n.* (from the noun.) To fill with sentiments of religion (*Shakspeare*).

GO'SPELLER. *s.* (from *gospel*.) A name of the followers of Wickliffe, who first attempted a reformation in popery, given them by the papists in reproach (*Rowe*).

GOSPORT, a fortified town in Hampshire, on the W. side of the harbour of Portsmouth, over which is a ferry. It has a market on Saturday; and here is a noble hospital, called Haslar hospital, for the sick and wounded of the royal navy. Lat. 50. 49 N. Lon. 1. 3 W.

GOSSAMER, a fine filmy substance, like cobweb, seen to float in the air in clear days in autumn, and more observable in stubble-fields, and upon furze and other low bushes. This is probably formed by the flying-spider, which, in traversing the air for food, shoots out these threads from its anus, which are borne down by the dew, &c.

It has been commonly affirmed, that the gossamer, when it settles, deposits itself in directions nearly north and south, that is, parallel to the direction of the magnetic needle. But this is not true. A near inspection shews that the threads lie in all directions: but as they are generally observed when the sun is near the horizon, and at a time of the year when the luminary rises and sets about the east and west points of the compass, the rays of the sun cause those which lie from north to south to be visible at a distance from which the others are not seen.

GOSSAMER-INSECT, in entomology. See ACARUS.

GO'SSIP. *s.* (from ȝoꝺ and ꞅyp, relation, Saxon.) 1. One who answers for the child in baptism. 2. A tippling companion (*Shakspeare*.) 3. One who runs about tattling like women at a lying-in (*Dryden*).

To GO'SSIP. *v. n.* (from the noun.) 1. To chat; to prate; to be merry (*Shakspeare*.) 2. To be a pot-companion (*Shakspeare*.).

GO'SSIPRED. *s.* (*gossipry*, from *gossip*.) *Gossipred*, or compaternity, by the canon law is a spiritual affinity (*Davies*).

GOSSI'PIUM. Cotton. In botany, a genus of the class monadelphia, order polyandria. Calyx double; the outermost three-cleft: capsule three or four-celled; seeds wrapped in cotton. Ten species; a few American, but by far the greater number Asiatic plants.

Most of these afford a wool that may be usefully applied to mechanical or domestic purposes, or woven into cloths. The cotton shrubs of the American islands grow without the smallest cultivation, but their wool is coarse and short, and hence cannot easily be spun; if imported into Europe it might answer the purpose of felts in the manufacture of hats; but it is generally consumed by the inhabitants themselves, as stuffing for pillows and mattresses.

The generality of the West Indian species are annuals; but G. arboreum of India is a perennial tree, both in root and branch, rising in a straight line about eight feet high, with leaves in five palmate lobes: the lobes lanceolate, obtuse, and mucronate.

The cotton chiefly selected for propagation is G. herbaceum, a native of the East Indies; a pubescent herb; with the stem spotted with black at its top; leaves downy, peduncles branched, shorter than the petioles; outer calyx three-parted, with heart-shape, cut segments dotted with black; corol one-petalled, with a short tube, five-parted, the segments pale yellow, with five red spots at bottom; capsule three-valved, three-celled. The pods are not unfrequently as large as middling-sized apples. The common cotton plant thrives best in respect of good in new grounds; but best in respect of fruit in dry stony ground that has been tilled already; and hence such is the soil generally preferred by our planters. The period of cultivation commences in March and April, and continues during the spring rains. The holes for the seeds are made in distinct rows, something like hop-planting, at a distance of seven or eight feet from each other; the seeds are thrown in and earthed over; and when they have shot forth to the height of five or six inches, all the stems are pulled up, excepting two or three of the strongest. These are cropped twice before the end of August, nor do they bear fruit till after the second pruning. By such repeated croppings, the plant, though naturally an annual, may be prolonged and made to bear sufficiency of fruit to repay the planter for three years, yet it is better to renew them if there be opportunity. When the cotton is gathered in, the seeds are picked out from the wool, by means of a cotton-mill, of a simple contrivance, and perfectly adequate to the purpose.

GOT. The pret. and part. pass. of *get.*

GOTHA, a town of Upper Saxony, capital of a duchy of the same name, in Thuringia. Near it is the ducal observatory of Seeberge, the most beautiful and useful in Germany, on which the duke has expended upwards of 8300l. The superintendance of this observatory is entrusted to baron von Zach. Here, in 1798, a congress of astronomers was held; among the various objects discussed, they agreed to form some new constellations, as the Æronaut, &c. Gotha has a considerable trade in woollen manufactures, as also in wood and beer. Lat. 51. N. Long. 10. 52 E.

GOTHA, a river of Sweden, which issues from Lake Wenner, and falls into the North Sea at Gotheborg.

GOTHARD, one of the highest mountains in Switzerland; and from the top, where there is an hospital for monks, is one of the finest prospects in the world. It is eight miles from Aldorf.

GOTHEBORG, or GOTTENBURG, a flourishing town of Sweden, in W. Gothland, seated at the mouth of the Gotha, which forms an excellent harbour, the best situated for foreign trade of any in the kingdom, as it lies without the Sound. The inhabitants are computed to be 20,000. Here is a considerable herring fishery. Lat. 57. 42 N. Lon. 11. 44 E.

GOTHIC ARCHITECTURE, the term applied to that architecture so much used in Europe from the thirteenth to the sixteenth century, and which deviated very much from the proportions and characteristics of the Greek and Roman architecture. Under the article ARCHITECTURE we have suggested the propriety of giving up the appellation Gothic, and adopting those of Saxon and Norman. Still however, we suppose the authority of custom will cause the term Gothic to be retained; we shall, therefore, here speak of the Norman under that term.

The absolute Gothic, says Mr. Warton, or that which is free from all Saxon mixture, began with ramified windows, of an enlarged dimension, divided into several lights, and branched out at the top into a multiplicity of whimsical shapes and compartments, after the year 1300. The crusades had before dictated the pointed arch, which was here still preserved; but besides the alterations in the windows from the circular form of the Saxon, apparently fantastic capitals to the columns, and more ornament in the vaulting and other parts, were introduced. Of this fashion the body of Winchester cathedral, built by that munificent encourager of all public works, William of Wykeham, about the year 1390, will afford the justest idea. But certain refinements in this kind of architecture grew fashionable in or before the reign of Edward III. as is pretty evident from Chaucer's description of the structure of his *House of Fame:*

"And eke the hall and everie boure,
Without pecces or joynings,
But many subtell compassings
As habenries and pinnacles,
Imageries and tabernacles,
I saw, and full eke of windowes."

And in an old poem called Pierce the Plowman's Creede, written perhaps before Chaucer's, the author, in describing an abbey-church, has the following lines:

"Than I munte me forth the *minstre* for to knowen.
And awayted a woon, wonderly well ybild;
With arches on everich half, and bellyche ycorven
With crotchetes on corneres, with knottes of gold.
Wyd windowes ywrought, ywritten full thicke.

* * * * * * *

Tombes upon tabernacles, tyld upon loft,
Housed in hornes, harde sett abouten
Of armed alabaustre."

These innovations, at length were most beautifully displayed in the roof of the divinity school at Oxford, which began to be built in 1427. The university, in their letters to Kempe, bishop of London, quoted by Wood, speak of this edifice as one of the miracles of the age. They mention particularly, "Ornamenta ad naturalis cæli imaginem variis picturis, subtilique artificio, cælata; valvarum singularissima opera: turricularum apparatum," &c. Yet, even here there is nothing of that minute finishing, which afterwards appeared; there is still a massiness, though great intricacy and variety. The ornamental Gothic, at length, received its confirmation about 1441, in the very noble chapel of King's college, at Cambridge. This was the last Gothic building in England, in which strength united with ornament, or substance with elegance, formed an admirable whole. After this what Mr. Warton calls the florid Gothic arose; the first considerable appearance of which was in the chapel of St. George, at Windsor; and the last in the superb chapel of Henry VII. at Westminster. The florid Gothic is distinguished by an exuberance of decoration, by roofs, where the most delicate network is expressed in stone, and by a certain lightness of finishing, as in the roof of the choir at Gloucester, where it is thrown like a web of embroidery over the old Saxon vaulting. Many monumental shrines, so well calculated, on account of the smallness of their plan, to admit a multiplicity of delicate ornaments highly finished, afford exquisite specimens of this style. See Essays on Gothic Architecture.

In almost every specimen of Gothic architecture we observe tokens of a masterly acquaintance with the practice, if not the theory of building. Some particulars are noticed under the article ARCHITECTURE: this is a proper place for a few additional remarks. The principles of masonry, and not of carpentry, should be seen in our architecture, if we would have it

according to the rules of just taste. Now we affirm that this is the characteristic feature of what is called the Gothic architecture. In this no dependence is had on the transverse strength of stone. No lintels are to be seen; no extravagant projections. Every stone is pressed to its neighbours, and none is exposed to a transverse strain. The Greeks were enabled to execute their colossal buildings only by using immense blocks of the hardest materials. The Norman mason could raise a building to the skies without using a stone which a labourer could not carry to the top on his back. Their architects studied the principles of equilibrium; and having attained a wonderful knowledge of it, they indulged themselves in exhibiting remarkable instances. We call this false taste, and say that the appearance of insecurity is the greatest fault. But this is owing to our habits; our thoughts may be said to run in a wooden train, and certain simple maxims of carpentry are familiar to our imagination; and in the careful adherence to these consists the beauty and symmetry of the Greek architecture. Had we been as much habituated to the equilibrium of pressure, this apparent insecurity would not have met our eye: we should have perceived the strength, and we should have relished the ingenuity.

The Gothic architecture is perhaps intitled to the name of rational architecture, and its beauty is founded on the characteristic distinction of our species. It deserves cultivation: not the pitiful, servile, and unskilled copying of the monuments; this will produce incongruities and absurdities equal to any that have crept into the Greek architecture; but let us examine with attention the nice disposition of the groins and spaundrels; let us study the tracery and knots, not as ornaments, but as useful members; let us observe how they have made their walls like honey-combs, and admire their ingenuity as we pretend to admire the instinct infused by the Great Architect into the bee. All this cannot be understood without mechanical knowledge; a thing which few of our professional architects have any share of. Thus would architectonic taste be a mark of skill; and the person who presents the design of a building would know how to execute it without committing it entirely to the mason and carpenter.

GOTHIC COLUMN. See COLUMN *Gothic*.

GOTHLAND, one of the five general divisions of the kingdom of Sweden, containing the provinces of Ostrogothia or E. Gothland, Smoland, Westrogothia or W. Gothland, the isles of Gothland and Œland, Wermland, Dalia, Halland, Bleckingen, and Scania or Schonen.

GOTHLAND, or GOTTLAND, an island of Sweden, in the Baltic, about seventy miles in length, and twenty-five in its greatest breadth, formerly an independent kingdom, but now subject to the supreme court of justice at Stockholm. From its convenient situation, it has justly acquired the name of the eye of the Baltic. The soil is fertile, and there are fine woods of oaks and pines, good pastures, and profitable fisheries on the island; large quarties of stone, particularly the famous Gottland stone, and a soft grey sandy stone, which are exported to Stockholm and other places. Here are also found some curious species of stones, as stone corals, cornelians, agates, and beautiful petrefactions. In former times here were also fine marble quarries. Very good lime stones, tar, deal boards, beans, turneps, and an excellent breed of sheep are exported from this island. Gottland is not infested with bears or wolves, but is sufficiently stocked with deer, foxes, and hares: the inhabitants subsist by agriculture, grazing, fishing, working in the quarries, burning lime, and by several sorts of mechanic trades, and navigation. Lat. 57. to 58 N. Lon. 18. 6, to 19. 0 E.

GOTHOFRED (Dennis), a French writer upon civil law, was born at Paris in 1549; but quitting the catholic faith, he removed first to Geneva, and then into Germany, and taught law at several universities. He died in 1622.

GOTHOFRED (Theodosius), the eldest son of the preceding, became a member of the church his father had renounced. He was made counsellor of state in France, and acquired a high reputation for letters. He died in 1649.

GOTHORFRED (James), another son of Dennis, adhered to calvinism. He was five five times syndic of Geneva; and died there in 1652. He was a man of profound erudition.

GOTHOFRED (Dennis), son of Theodosius, was born at Paris, and died at Lisle, director of the chamber of accounts. He wrote the Histories of Charles VI. VII. and VIII.

GOTHOFRED (John), son of the preceding, succeeded to the office of his father. He died in 1732. He wrote some historical works.

GOTHS, a warlike nation, and above all others famous in the Roman history, came originally out of Scandinavia (the name by which the ancients distinguished the present countries of Sweden, Norway, Lapland, and Finmark.) According to the most probable accounts, they were the first inhabitants of those countries; and from thence sent colonies into the islands of the Baltic, the Cimbrian Chersonesus, and the adjacent places yet destitute of inhabitants

The Goths were famous for their hospitality and kindness to strangers, even before they embraced the Christian religion. Nay, it is said, that, from their being eminently good, they were called Goths by the neighbouring nations; that name, according to Grotius and most other writers, being derived from the German word *gotten*, which signifies "good." They encouraged, says Dio, the study of philosophy above all other barbarous or foreign nations, and often chose kings from among their philosophers. Polygamy was not only allowed but countenanced among them; every one being valued or respected according to the number of his wives. By so many wives they had an incredible number of children, of whom

they kept but one at home, sending out the rest in quest of new settlements; and hence those swarms of people which overran so many countries. With them adultery was a capital crime, and irremissibly punished with death.

The time of the first settling of the Goths in Scandinavia, and that when they first peopled with their colonies the abovementioned islands and Chersonesus, are equally uncertain; though the Gothic annals suppose the latter to have happened in the time of Serug the great grandfather of Abraham. This first migration of the Goths is said to have been conducted by their king Eric; in which all the ancient Gothic chronicles, as well as the Danish and Swedish ones, agree. Their second migration is supposed to have happened many ages after; when, the abovementioned countries being overstocked with people, Berig, at that time king of the Goths, went out with a fleet in quest of new settlements. He landed in the country of the Ulmerugians, now Pomerania, drove out the ancient inhabitants, and divided their lands among his followers. He fell next upon the Vandals, whose country bordered on that of the Ulmerugians, and overcame them; but instead of forcing them to abandon their country, he only made them share their possessions with the Goths.

The Goths who had settled in Pomerania and the adjacent parts of Germany being greatly increased, insomuch that the country could no longer contain them, they undertook a third migration in great numbers, under Filimer surnamed the Great, their fifth prince after leaving Scandinavia; and taking their course eastward, entered Scythia, advanced to the Cimmerian Bosphorus, and, driving out the Cimmerians, settled in the neighbourhood of the Palus Mæotis. Thence in process of time, being greatly increased in Scythia, they resolved to seek new settlements; and, accordingly taking their route eastward, they traversed several countries, and at length returned into Germany. Their leader in this expedition was the celebrated Woden.

The Romans distinguished the Goths into two classes; the Ostrogoths and Visigoths. These names they received before they left Scandinavia, the Visigoths being softened by the Latins from Westerogoths, or those who inhabited the western part of Scandinavia, as the Ostrogoths were those of the eastern part of that country. Their history affords nothing of moment till the time of their quarelling with the Romans; which happened under the reign of the emperor Caracalla, son to Severus. After that time it becomes so closely interwoven with that of the Romans, that for the most remarkable particulars of it we must refer to the histories of Rome. After the destruction of the Roman empire by the Heruli, the Ostrogoths, under their king Theodoric, became masters of the greatest part of Italy, having overcome and put to death Odoacer, king of the Heruli, in 494. They retained their dominion in this country till the year 553; when they were finally conquered by Narses, the emperor Justinian's general. The Visigoths settled in Spain in the time of the emperor Honorius, where they founded a kingdom which continued till the country was subdued by the Saracens.

GOTTEN. The part. passive of *get*.

GOTTINGEN, or GOETINGEN, a town of Germany, in the circle of Lower Saxony, and principality of Calenberg, and principal town of a quarter, or district, to which it gives name, situated in an agreeable, spacious, and fertile valley, on a canal, or branch of the river Leine, which passes through, and divides it into the New Town and Marsch. It contains about 1000 houses, and 8000 souls; the streets are large and convenient, and paved on each side. The principal ornament and advantage of Gottingen is the university, founded in the year 1734, by George II. king of England, and consecrated on the seventeenth of September, 1737; which university, by the inexpressible attention and care of its first curator, baron Munchausen, has acquired a very distinguished reputation. Belonging to it is a large splendid church, with a peculiar pastor, and to it likewise belong a new and stately structure of stone, the ground floor of which serves as a hall for public lectures, and that above is the library, with a council chamber, and other apartments. This library, to which considerable additions are every year made, if considered with regard to the number, goodness, and value of its books, is one of the most capital libraries in Europe. It is called the Bulowcan, having received its origin from a collection of about 10,000 volumes, bequeathed by the baron Bulow for the public use, and by his heirs given to the university. A royal society of sciences, founded in 1751, and a royal German society, also form part of the university. It has likewise a fine observatory, erected on a tower on the rampart, with a physic garden, and near it a handsome anatomical theatre of ingenious construction, a school for teaching midwifery, &c. The territory belonging to the town is very considerable: twenty-two miles N.E. Cassel, and fifty-one E.S.E. Paderborn. Lon. 27. 19 E. Lat. 51. 24 N.

GOTTORP, a town of Denmark, in the duchy of Sleswick, capital of the duchy of Holstein Gottorp. Here is a fine old palace, formerly the ducal residence. Gottorp is seated at the bottom of an arm of the sea called the Slev. Lat. 54. 36 N. Lon. 9. 56 E.

GOUANIA. Chawstick. In botany, a genus of the class polygamia, order monœcia. Hermaphrodite: calyx five cleft; corolless; anthers five under a veil; styles three-cleft; fruit dry, divisible into three parts. One species: a native of St. Domingo, with shrubby stem, climbing by axillary tendrils; leaves ovate with a point, toothed, glabrous; racemes furnished with a leaflet or two.

GOUDA, or TURGOW, a considerable town of South Holland, in the United Provinces, remarkable for its stately church. Lat. 52. 2 N. Lon. 4. 41 E.

GOUDHURST, a town in Kent, with a market on Wednesdays. Lat. 51. 8 N. Lon. 0. 31 E.

GOVE. *s.* A mow (*Tusser*).

To GOVE. *v. n.* To mow; to put in a gove, goff, or mow (*Tusser*).

To GO'VERN. *v. a.* (*gouverner*, Fr.). 1. To rule as chief magistrate (*Spenser*). 2. To regulate; to influence; to direct (*Att.*). 3. To manage; to restrain (*Shaks.*). 4. (In grammar.) To have force with regard to syntax: as, *amo governs* the accusative case. 4. To pilot; to regulate the motions of a ship.

To GO'VERN. *v. n.* To keep superiority; to behave with haughtiness (*Dryden*).

GO'VERNABLE. *a.* (from *govern*). Submissive to authority; subject to rule (*Locke*).

GO'VERNANCE. *s.* (from *govern*). 1. Government; rule; management (*Macc.*). 2. Control, as that of a guardian (*Spenser*). 3. Behaviour; manners: obsolete (*Spenser*).

GO'VERNANT. *s.* (*gouvernante*, Fr.) A lady who has the care of young girls of quality.

GO'VERNESS. *s.* (*gouvernesse*, Fr.). 1. A female invested with authority (*Shaks.*). 2. A tutoress; a woman that has the care of young ladies (*Clarendon*). 3. An instructress; a directress (*More*).

GO'VERNMENT. *s.* (*gouvernement*, Fr.). 1. Form of a community with respect to the disposition of the supreme authority (*Temple*). 2. An establishment of legal authority (*Dry.*). 3. Administration of public affairs (*Young*). 4. Regularity of behaviour (*Shaks.*). 5. Manageableness; compliance; obsequiousness (*Shaks.*). 6. Management of the limbs or body (*Spenser*). 7. (In grammar). Influence with regard to construction.

GOVERNMENT, in general, is the polity of a state, or an orderly power constituted for the public good. Civil government was instituted for the preservation and advancement of men's civil interests, and for the better security of their lives, liberties, and property. The use and necessity of government is such, that there never was an age or country without some sort of civil authority: but as men are seldom unanimous in the means of attaining their ends, so their difference in opinion in relation to government has produced a variety of forms of it. To enumerate them would be to recapitulate the history of the whole earth. But, according to Montesquieu and most other writers, they may in general be reduced to one of these three kinds. 1. The republican. 2. The monarchical. 3. The despotic. The first is that, where the people in a body, or only a part of the people, have the sovereign power; the second, where one alone governs, but by fixed and established laws; but in the despotic government, one person alone, without law and without rule, directs every thing by his own will and caprice. See the article LAW.

On the subject of government at large, see Montesquieu's L'Esprit des Loix, l. 2. c. 1; Locke, ii. 129, &c. quarto edition, 1768; Sidney on Government; Sir Thomas Smith de Repub. Angl.; and Archerly's Britannic Constitution. As to the Gothic government, its original, and faults, &c. see Montesquieu's L'Esprit des Loix, l. 11. c. 8. With respect to the feudal policy, how it limited government, see FEUDAL SYSTEM. See also ARISTOCRACY, CONSTITUTION, DEMOCRACY, &c.

A mixed government is composed by the combination of the simple forms of government which have already been, or will hereafter be, described; and, in whatever proportion each form enters into the constitution of a government, in the same proportion may both the advantages and evils, which have been attributed to that form, be expected. The government of this country is unquestionably a mixed government, though by some writers it is denominated a limited monarchy. It is formed by a combination of the three regular species of government; the monarchy residing in the king, the aristocracy in the house of peers, and the republic being represented by the house of commons. The perfections intended, and, with regard to the United Kingdoms, in a considerable degree effected, is to unite the advantages of the several simple forms, and to exclude the inconveniences. "For, as with us," says sir William Blackstone, "the executive power of the laws is lodged in a single person, they have all the advantages of strength and dispatch that are to be found in the most absolute monarchy; and as the legislature of the kingdom is entrusted to three distinct powers, entirely independent of each other: first, the king; secondly, the lords, spiritual and temporal, which is an aristocratical assembly of persons selected for their piety, their birth, their wisdom, their valour, or their property; and, thirdly, the house of commons, freely chosen by the people from among themselves, which makes it a kind of democracy: as this aggregate body, actuated by different springs, and attentive to different interests, composes the British parliament, and has the supreme disposal of every thing, there can be no inconvenience attempted by either of the three branches, but will be withstood by one of the other two; each branch being armed with a negative power sufficient to repel any innovation which it shall think inexpedient or dangerous." See MONARCHY.

GOVERNOLO, a town of Mantua, in Italy, 12 miles N.W. of Mirandole. Lat. 45. 4 N. Lon. 10. 56 E.

GO'VERNOUR. *s.* (*gouverneur*, Fr.). 1. One who has the supreme direction (*Hooker*). 2. One who is invested with supreme authority in a state (*South*). 3. One who rules any place with delegated and temporary authority (*Shaks.*). 4. A tutor; one who has care of a young man (*Shaks.*). 5. Pilot; regulator; manager (*James*).

GOUGE, an instrument or tool used by divers artificers; being a sort of round hollow chisel, for cutting holes, channels, grooves, &c. either in wood or stone.

GOURA, or GURA, a town of Mazovia, in Poland; the greater part of the inhabitants are ecclesiastics. Lat. 52. 1 N. Lon. 21. 50 E.

GOURD. In botany. See CUCURBITA.

GOURD (Ethiopian, sour). See ADANSONIA.

GOURD TREE (Indian). See CRESCENTIA.

GOURD-WORM, in helminthology. See FASCIOLA.

GOURDINESS, among farriers implies a diffused swelling in a horse's legs, of a dropsical or œdematous nature. It often lays a foundation for *grease*, and will produce it if not counteracted by such evacuants as appear most applicable to the case.

GOURNAY, a town of France, in the department of Lower Seine, remarkable for its fine butter. Lat. 49. 32 N. Lon. 0. 36 W.

GOUSSIER (Louis James), a celebrated French mathematician, was born in the year 1722, and applied at a very early period to the study of the mathematics. His first labours were, to arrange and superintend the publication of the memoirs, which the celebrated Condamine gave to the public in 1751, on the measurement of the three first degrees of the meridian in the southern hemisphere. In consequence of the ability which he displayed by the part he took in this interesting work, he was invited to co-operate in the Encyclopedie with Diderot and D'Alembert. Being charged with the part respecting the mechanical arts, Goussier exercised several of them himself, that he might be better able to give a description of them; such as those of watch-making, lock-making, cabinet-making, turning, &c. His articles display clearness, precision, and method. About the year 1760, the baron de Marivet invited Goussier to reside with him, in order that he might improve himself in natural philosophy. In 1779 they distributed the prospectus of a New Philosophy of the World, which they proposed to publish conjointly, and which was to make fourteen volumes in quarto; but it was never carried farther than the eighth. Goussier was fond of travelling on foot, and in this manner went over all France. He had a great attachment to hydraulics, and was acquainted with every river and canal in the kingdom. With the same baron Marivet he published, in 1789, a work, in two volumes octavo, on the Internal Navigation of France, with an atlas adapted to the subject. He invented several curious pieces of mechanism, among which is a mill with portable arms for sawing planks. This piece of mechanism was sent to Poland to serve as a model for the mills destined to manufacture the timber of the immense forests of that country. He invented also a water level, much used by land surveyors. He died at Paris, Oct. 23, 1799, aged 77 years.

GOUT. See MEDICINE, and ARTHRITIS.

GO'UTY. *a.* (from *gout.*) 1. Afflicted or diseased with the gout (*Dryd.*). 2. Relating to the gout (*Blackmore*).

GOWER, the peninsulated extremity of Glamorganshire, to the W. of the bay of Swansea. It has very lofty limestone cliffs next the sea, whence large quantities of lime are exported to the English counties across the Bristol channel. The land is a fertile tract of arable and pasture.

GOWER (John), one of our most ancient English poets, was cotemporary with Chaucer, and his intimate friend. Of what family or in what country he was born is uncertain. He studied the law, and was some time a member of the society of Lincoln's-inn, where his acquaintance with Chaucer began. Some have asserted that he was a judge; but this is by no means certain. In the first year of Henry IV. he became blind; a misfortune which he laments in one of his Latin poems. He died in the year 1402, and was buried in St. Mary Overie, which church he had rebuilt chiefly at his own expence, so that he must have lived in affluent circumstances. His tomb was magnificent, and curiously ornamented. It still remains, but hath been repaired in later times. From the collar of SS. round the neck of his effigies, which lies upon the tomb, it is conjectured that he had been knighted. As to his character as a man, it is impossible, at this distance of time, to say any thing with certainty. With regard to his poetical talents, he was undoubtedly admired at the time when he wrote, though a modern reader may find it difficult to discover much harmony or genius in any of his compositions. He wrote, 1. Speculum meditantis, in French, in ten books. There are two copies of this in the Bodleian library. 2. Vox clamantis, in Latin verse, in seven books. Preserved also in the Bodleian library, and in that of All-Souls. It is a chronicle of the insurrection of the commons in the reign of Richard II. 3. Confessio amantis; printed at Westminster by Caxton in 1493. Lond. 1532, 1554. It is a sort of poetical system of morality, interspersed with a variety of moral tales. 4. De rege Henrico IV. Printed in Chaucer's works. There are likewise several historical tracts in manuscript, written by our author, which are to be found in different libraries; also some other short poems printed in Chaucer's works.

GOWN. *s.* (*gonna*, Italian). 1. A long upper garment (*Abbot*) 2. A woman's upper garment (*Pope*). 3. The long habit of a man dedicated to acts of peace, as divinity, medicine, law (*Young*). 4. The dress of peace (*Dryden*).

GO'WNED. *a.* Dressed in a gown (*Dry.*).

GO'WNMAN. *s* (*gown* and *man.*) A man devoted to the acts of peace; one whose proper habit is a gown (*Rowe*).

GOWRIE, in helminthology. See CYPRÆA.

GOUYE (Thomas), a French jesuit and eminent mathematician, was born at Dieppe in 1650, and died at Paris in 1725. His principal work is entitled Mathematical and Philosophical Observations, two vols. 8vo. This writer must not be confounded with Gouye de Longuemare, who wrote various memoirs and dissertations to illustrate the History of France.

GRAAF (Regnier de), an eminent physician, was born at Schoonhaven in Holland in 1641. He died at the age of 32, leaving behind several works which do honour to his memory. Two editions of them have been

published in one vol. 8vo. at Leyden, the last in 1705.

GRABE (John Ernest), a very learned divine, was born in 1666, at Koningsberg in Prussia. He devoted himself early to the study of divinity; and having read the works of the fathers, he became so convinced of the necessity of an uninterrupted succession in the ministry of the church, that he left his native country with the design of embracing the Roman catholic religion. On the road, three tracts, in answer to the memorial which he had left behind him explaining his r[illegible] for quitting the college, written by the o[illegible] the elector of Brandenburg, were presented to him, and Grabe immediately changed his mind, so far as to hold a conference at Berlin with Spener, the author of one of the tracts; the result of which was, that Grabe was prevailed on to go to England, where an ecclesiastical succession was maintained, without the superstitions of the Romish worship. Here he received considerable patronage, and the university of Oxford conferred on him the degree of D.D. He published several valuable works, the principal of which is an edition of the Septuagint. He died in 1712, and was buried in Westminster abbey.

To GRA'BBLE. *v. n.* To grope (*Arbuth.*).

To GRA'BBLE. *v. a.* To lie prostrate on the ground (*Ainsworth*).

GRACCHUS (T. Sempronius), father of Tiberius and Caius Gracchus, was twice consul and once censor. He made war in Gaul, and met with much success in Spain. He married Sempronia, of the family of the Scipios, a woman of great virtue. Their sons Tiberius and Caius, under the watchful eye of their mother, rendered themselves famous for an obstinate attachment to the interests of the populace, which at last proved fatal to them. With a winning eloquence, and uncommon popularity, Tiberius began to renew the Agrarian law, which, by the means of violence, was enacted. Being himself appointed one of the commissioners for putting the law into execution, he was assassinated in the office by Pub. Nasica; and Caius, after his death, with more vehemence, but less moderation, endeavoured to carry the law into effect. This in the end increased the sedition, and he was murdered by order of the consul Opimius, B. C. 121, about 13 years after the unfortunate end of Tiberius. His body was thrown into the Tiber. Caius has been accused of having murdered Scipio Africanus, the younger. —2. Sempronius, a Roman, banished to the coast of Africa for his adulteries with Julia, the daughter of Augustus. He was assassinated by order of Tiberius, after he had been banished 14 years. Julia also shared his fate. —There were others also of this name, but of inferior note.

GRACE. *s.* (*grace*, French). 1. Favour; kindness (*Sidney*). 2. Favourable influence of God on the human mind (*Common Pray.*). 3. Virtue; effect of God's influence (*Pope*). 4. Pardon; mercy (*Milton*). 5. Favour conferred (*Prior*). 6. Privilege (*Dryden*). 7. A goddess, by the heathens supposed to bestow beauty (*Prior*). 8. Behaviour, considered as decent or unbecoming (*Temple*). 9. Adventitious or artificial beauty (*Dryden*). 10. Natural excellence (*Hooker*). 11. Embellishment; recommendation; beauty (*Dryden*). 12. Single beauty (*Dryden*). 13. Ornament; flower; highest perfection (*Shaks.*). 14. Single or particular virtue (*Shaks.*) 15. Virtue physical (*Shaks.*). 16. The title of a duke or archbishop; formerly of the king, meaning the same as *your goodness*, or *your clemency* (*Ba.*) 17. A short prayer said before and after meat (*Swift*).

Some of these meanings we must enlarge upon, as below:

GRACE, among divines, is taken, 1. For the free love and favour of God, which is the spring and source of all the benefits we receive from him. 2. For the work of the Spirit renewing the soul after the image of God; and continually guiding and strengthening the believer to obey his will, to resist and mortify sin, and overcome it.

GRACE is also used, in a peculiar sense, for a short prayer said before and after meat. The proofs of the moral obligation of this ceremony, drawn from different passages of the New Testament, are well known. Some others, drawn from the practice of different nations, and of very remote antiquity, we shall introduce in this place.

1. Athenæus tells us, in his Deipnosoph. lib. ii. that in the famous regulation made by Amphictyon king of Athens with respect to the use of wine, both in sacrifices and at home, he required that the name of Jupiter the Sustainer should be decently and reverently pronounced. The same writer, in lib. iv. p. 149. quotes Hermeias, an author extant in his time, who informs us of a people in Egypt, inhabitants of the city of Naucratis, whose custom it was on certain occasions, after they had placed themselves in the usual posture of eating at the table, to rise again and kneel; when the priest or precentor of the solemnity began to chant a grace, according to a stated form amongst them; and when that was over, they joined in the meal in a solemn sacrificial manner. Heliodorus has a passage in his Æthiopics to the same purpose, that it was the custom of the Egyptian philosophers to pour out libations and put up ejaculations before they sat down to meals. Porphyry, in his treatise De abstin. lib. iv. p. 408. gives a great character of the Samnean gymnosophists in Egypt for the strictness of their life; as one article in their favour, he observes, that the sounding of a bell before their meals, which consisted only of rice, bread, fruits, and herbs, they went to prayers; which being ended, and not before, the bell sounded again, and they sat down to eating. In general this was a religious usage or rite amongst the ancient Greeks, and derived from yet older ages, if Clement of Alexandria rightly informs us. He mentions, that these people, when they met together to refresh

themselves with the juice of the grape, sung a piece of music in imitation of the Hebrew psalms, which they called a *scholion*. Livy, lib. xxxix. speaks of it as a settled custom among the old Romans, that they offered sacrifice and prayer to the gods at their meals and compotations. But one of the fullest testimonies to our purpose is given by Quintilian, *Declam*. 301. *Adesti mensam*, says he, *ad quam cum venire cœpimus, Deos invocamus*; "We approached the table (at supper together), and then invoked the gods."

The jesuit Trigautius, in his very elegant and instructive narrative of the Christian expedition of their missionaries into China, book i. p. 69. gives this account of the people there in the particular now under consideration. "Before they place themselves for partaking of an entertainment, the person who makes it sets a vessel, either of gold, or silver, or marble, or some such valuable material, in a charger full of wine, which he holds with both his hands, and then makes a low bow to the person of chief quality or character at the table. Then, from the hall or dining-room, he goes into the porch or entry, where he again makes a very low bow, and, turning his face to the south, pours out this wine upon the ground as a thankful oblation to the Lord of heaven. After this, repeating his reverential obeisance, he returns into the hall," &c.

The Turks pray for a blessing on their meat; and many more instances might be produced of infidels who have constantly observed the like custom in some way or other. That the prophet Daniel gave thanks before meat is evident from the Apocryphal book concerning Bel and the Dragon, where, ver. 38, 39. we find, that "Daniel said, Thou hast remembered me, O God! neither hast thou forsaken them who seek thee and love thee. So Daniel arose, and did eat." Of this text Prudentius takes notice in Cathem. hymn iv.

Grace, or Gracefulness, an agreeable attribute, being the noblest part of beauty. Every judge of beauty can point out grace, but few attempt a definition of it. Grace often depends on something very incidental in a fine face; and in actions it consists more in the manner of doing things than in the things themselves. It is perpetually varying its appearance, and is therefore much more difficult to be considered than in any thing fixed and steady. While we are admiring, it steals from under the eye of the observer; and is succeeded perhaps by another that escapes as soon and as imperceptibly. It is on this account that grace is better to be studied in Corregio's, Guido's, and Raphael's pictures, than in real life.

Though at times it may visit every limb or part of the body, yet the mouth is the chief seat of grace, as much as the chief seat for the beauty of the passions is in the eyes. Thus, when the French use the expression of *une bouche fort gracieuse*, they mean it properly of grace: but when they say *des yeux tres gracieux*, it then falls to the share of the passions; and means kind or favourable. In a very graceful face, by which we do not so much mean a majestic as a soft and pleasing one, there is now and then (for no part of beauty is either so engaging or so uncommon) a certain deliciousness that almost always lives about the mouth, in something not quite enough to be called a smile, but rather an approach toward one, which varies gently about the different lines there like a little fluttering Cupid, and perhaps sometimes discovers a little dimple, that after just lightening upon you disappears and appears again by turns.

The grace of attitude may belong to the position of each part, as well as to the carriage or disposition of the whole body: but how much more it belongs to the head than to any other part may be seen in the pieces of the most celebrated painters, and particularly in those of Guido, who has been rather too lavish in bestowing this beauty on almost all his fine women; whereas nature has given it in so high a degree but to very few. The turns of the neck are extremely capable of grace, and are very easy to be observed, though very difficult to be accounted for. How much of this grace may belong to the arms and feet, as well as to the neck and head, may be seen in dancing. But it is not in genteel motions alone that a very pretty woman will be graceful; and Ovid, who was so great a critic in beauty, had very good reason for saying, That when Venus, to please her gallant, imitated the hobbling gait of her husband, her very lameness had a great deal of prettiness and grace in it. "Every motion of a graceful woman, says Tibullus (a writer of the same age), is full of grace." She designs nothing by it perhaps, and may not even be sensible of it herself: and indeed she should not be so; for the moment any gesture or action is affected, it ceases to be graceful.

Horace and Virgil seem to extend grace so far as to the flowing of the hair, and Tibullus even to the dress of his mistress; but then he assigns it more to her manner of putting on and appearing in whatever she wears, than to the dress itself. It is true, there is another wicked poet (Ovid) who has said with much less decency, "that dress is the better half of the woman:"—Pars minima est ipsa puella sui.

There are two very distinct, and as it were opposite, sorts of grace; the majestic and the familiar. The former belongs chiefly to very fine women, and the latter to very pretty ones. That is more commanding, and this the more delightful and engaging. The Grecian painters and sculptors used to express the former most strongly in the looks and attitudes of their Minervas, and the latter in those of Venus. Xenophon, in his Choice of Herculus (or at least the excellent translator of that piece), has made just the same distinction in the personages of wisdom and pleasure; the former of which he describes as moving on to that young hero with the majestic sort of grace; and the latter with the familiar:

Graceful, yet each with different grace they move;
This striking sacred awe, that softer winning love.

No poet seems to have understood this part of beauty so well as Milton. He speaks of these two sorts of grace very distinctly; and gives the majestic to Adam, and both the familiar and majestic to Eve; but the latter in a less degree than the former:

Two of far nobler shape, erect and tall,
Godlike erect, with native honour clad,
In naked majesty, seem'd lords of all;
And worthy seem'd. For in their looks divine
The image of their glorious Maker shone:
Truth, wisdom, sanctitude severe and pure;
Severe, but in true filial freedom plac'd;
Whence true authority in men: though both
Not equal, as their sex not equal, seem'd.
For contemplation he, and valour, form'd;
For softness she, and sweet attractive grace.
Par. Lost, b. iv. 298.

———I espy'd thee, fair indeed and tall,
Under a plantain; yet methought less fair,
Less winning soft, less amiably mild,
Than that smooth wat'ry image.——
(*Eve, of Adam and herself*) *Ib.* ver. 480.

——————Her heav'nly form
Angelic, but more soft and feminine;
Her graceful innocence; her ev'ry air
Of gesture, or least action.
B. ix. 461.

Grace was in all her steps; heav'n in her eye;
In ev'ry gesture, dignity and love.
B. viii. 489.

Speaking, or mute, all comeliness and grace
Attends thee; and each word, each motion, forms.
Ib. 223.

But though grace is so difficult to define, yet there are two particular things which seem to hold universally in relation to it. The first is, "That there is no grace without motion;" that is, without some genteel or pleasing motion, either of the whole body or of some limb, or at least of some feature. And it may be hence that lord Bacon calls grace by the name of decent motion, just as if they were equivalent terms: "in beauty, that of favour is more than that of colour; and that of gracious and decent motion more than that of favour." Virgil in one place points out the majesty of Juno, and in another the graceful air of Apollo, by only saying that they move; and possibly he means no more when he makes the motion of Venus the principal thing by which Æneas discovers her under all her disguise; though the commentators, as usual, would fain find out a more dark and mysterious meaning for it. All the best statues are represented as in some action or motion; and the most graceful statue in the world, the Apollo Belvedere, is so much so, that when we face it at a little distance, we are almost apt to imagine that he is actually going to move towards us.

All graceful heads, in the portraits of the best painters, are in motion; and very strongly on those of Guido in particular; which are all either casting their looks up toward heaven, or down toward the ground, or side-way, as regarding some object. A head that is quite inactive, and laid flat upon the canvas, like the faces on medals after the fall of the Roman empire, or the Gothic heads before the revival of the arts, will be so far from having any grace, that it will not even have the least appearance of animation.

The second observation is, "That there can be no grace with impropriety;" or, in other words, that nothing can be graceful that is not conformable to the character and situation of the person in question. For instance, the graces of a little lively beauty would become ungraceful in majesty; and so would the majestic airs of an empress quite destroy the prettiness of the former. The vivacity that adds a grace to beauty in youth would give an additional deformity to old age; and the very same airs which would be charming on some occasions, would be shocking if greatly ill-timed or misplaced.

Indeed the inseparable union of propriety and grace seems to have been the general sense of mankind, as we may deduce from the languages of several nations; in which the words that answer to what we term proper or becoming, are used indifferently for beautiful or graceful. Thus, among the Greeks, the words Πρεπον and Καλον, and among the Romans *pulchrum* and *decens*, or *decorum*, are used indifferently for each other.

Those are wrong, however, who have gone so far as to assert, that grace consists entirely in propriety; because propriety is a thing easy enough to be understood, and grace, after all that we can say about it, very difficult. Propriety, therefore, and grace are no more one and the same thing than grace and motion are. It is true, it cannot subsist without either; but then there seems to be something else superadded, which cannot be explained, but which possibly may give it its greatest force and effect.

Whatever are the causes of it, this is certain, that grace is the chief of all the constituent parts of beauty; and so much so, that it seems to be the only one which is absolutely and universally admired: all the rest are only relative. One likes a brunette beauty better than a fair one; I may love a little woman, and you a large one, best; a person of a mild temper will be fond of the gentler passions in the face, and one of a bolder cast may choose to have more vivacity and more vigorous passions expressed there: but grace is found in few, and is pleasing to all. Grace, like poetry, must be the gift of the Creator; it is never wholly to be acquired by art. The most celebrated of all the ancient painters was Apelles, and the most ce-

lebrated of all the modern, Raphael; and it is remarkable that the distinguishing character of each of these was grace. Indeed, that alone could have given them so high a pre-eminence over all their competitors.

GRACE (Act of), the appellation given to any act of parliament which allows prisoners for civil debts to be set at liberty, upon making oath that they have surrendered to their creditors their whole property, and have not wherewithal to support themselves in prison. Other conditions have also been imposed in the acts for the relief of insolvent debtors which have of late years been passed by parliament.

GRACE (Days of), three days immediately following the term of payment of a bill, within which the creditor must note and protest it if payment is not obtained, in order to intitle him to recover against the drawer.

GRACE is also a title of dignity given to dukes, archbishops, and in Germany to barons and other inferior princes.

To GRACE. *v. a.* (from the noun.) 1. To adorn; to dignify; to embellish (*Pope*). 2. To dignify or raise by any act of favour (*Shakspeare*). 3. To favour (*Dryden*).

GRACE-CUP. *s.* (*grace* and *cup*.) The cup or health drank after grace (*Prior*).

GRA'CED. *a.* (from *grace*.) Not in use. 1. Beautiful; graceful (*Sidney*). 2. Virtuous; regular; chaste (*Shakspeare*).

GRA'CEFUL. *a.* (from *grace*.) Beautiful with dignity (*Pope*).

GRA'CEFULLY. *ad.* Elegantly; with pleasing dignity (*Swift*).

GRA'CEFULNESS. *s.* Elegance of manner; dignity with beauty (*Dryden*).

GRA'CELESS. *a.* (from *grace*.) Void of grace; wicked; abandoned (*Spenser*).

GRA'CES. *s. Good graces* for favour is seldom used in the singular. (*Hudibras*).

GRACES, GRATIÆ, *Charites*, in the heathen theology, were fabulous deities, three in number, who attended on Venus. Their names are, Aglia, Thalia, and Euphrosyne; i. e. shining, flourishing, and gay; or according to some authors, Pasithea, Euphrosyne, and Ægiale. They were supposed by some to be the daughters of Jupiter and Eurynome the daughter of Oceanus; and by others, to be the daughters of Bacchus and Venus.

GRACES, in music, the general name given to those occasional embellishments which a performer or composer introduces to heighten the effect of the piece. Besides the appogiatura, Dr. Busby mentions the following, with their characters:

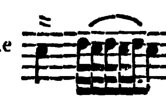
The *staccato* '''' or distinct and pointed manner of performance. The *mezzo staccato* ···· or extremely smooth and distinct. With these again may be included the *piano*, or soft; the *mezzo piano*, or rather soft: and the *pianissimo*, or very soft: the *forte*, or loud; the *mezzo forte*, or rather loud; and the *fortissimo*, or very loud. The several gradations of sound in point of loudness are expressed as follow , *crescendo*, or gradual increase in strength. , *diminuendo*, or gradual decrease in strength.

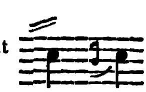
 crescendo & diminuendo.

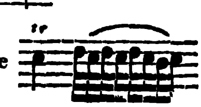
 diminuendo & crescendo.

The turn 

Back turn 

Passing shake 

Beat 

Turned shake 

GRA'CILE. *a.* (*gracilis*, Latin.) Slender; small.

GRA'CILENT. *a.* (*gracilentus*, Latin.) Lean.

GRACILIS. (*gracilis*, from its smallness.) Rectus internus femoris of Winslow. In anatomy. This long, straight, and slender muscle, is situated immediately under the integuments at the inner part of the thigh. It arises by a broad and thin tendon from the anterior part of the ischium and pubis, and soon becoming fleshy, descends nearly in a straight direction along the inside of the thigh. A little above the knee it terminates in a slender and roundish tendon, which afterwards becomes flatter, and is inserted into the middle of the tibia behind and under the sartorius. Under the tendons of this and the rectus there is a considerable bursa mucosa, which on one side adheres to them and to the tendon of the semi tendinosus, and on the other to the capsular ligament of the knee. This muscle assists in bending the thigh and leg inwards.

GRACI'LITY. *s.* (*gracilitas*, Latin.) Slenderness; smallness.

GRACIOSA, one of the Azores, or Western Islands. It contains about 300 inhabitants. Lat. 39. 2 N. Lon. 27. 58 W.

GRACIOSA, a very small island, being one of the Canaries.

GRA'CIOUS. *a.* (*gracieux*, French.) 1. Merciful; benevolent (*South*). 2. Favourable; kind (*Prior*). 3. Acceptable; favoured

(*Clarendon*). 4. Virtuous; good (*Shakspeare*). 5. Excellent: obsolete (*Hooker*). 6. Graceful; becoming: obsolete (*Camden*).

GRA'CIOUSLY. *ad.* 1. Kindly; with kind condescension (*Dryden*). 2. In a pleasing manner.

GRA'CIOUSNESS. *s.* 1. Kind condescension (*Clarendon*). 2. Pleasing manner.

GRACULA. Grakle. In zoology, a genus of the class aves, order picæ. Bill convex, sharp-edged, nakedish at the base; tongue entire, sharpish, fleshy; feet ambulatory. Thirteen species, natives of India and South America; some of them of Europe; have a thick bill compressed at the sides, with small nostrils at the base, and sharp hooked claws; the middle toe of the fore-feet connected at the base to the outer. The following are the chief species:

1. G. religiosa. Minor grakle. Violet black; spot on the wings white; hind-head with a yellow naked band. There is another variety much larger. Both inhabit Asia: the first is ten and a half inches long; feeds on cherries, grapes, and other fruits; when tamed is exceedingly loquacious. See Nat. Hist. Pl. CXX.

2. G. barita. Boat-tailed grakle. Greyish; shoulders blue; quill-feathers outside green. Bill shortish, blackish, beneath paler, naked at the base; tail rounded and concave when folded, which it always is when on the wing; but flat when spread open. Inhabits America and the Antilles: thirteen inches long; feeds on insects and fruits.

3. G. cristellata. Crested grakle. Black; the first quill-feathers at the base, and tail-feathers at the tip white; bill yellow: plumage inclining to blue; irids orange; feathers of the front long, and erected at pleasure into a crest; greater quill-feathers, from the base to the middle, white, the other part deep blue; legs yellow. Inhabits China; eight and a half inches long; is very loquacious, and makes a hissing noise; feeds on rice, worms, and insects.

4. G. quiscala. Purple grakle. Violet-black; tail rounded. Another variety with the body white and black; head white; quill-feathers and tail black; wings and tail purple, the latter long, and wedged. Inhabits Mexico, the warm parts of America and Jamaica. Male thirteen and a half, female eleven and a half inches long; sings finely; and builds in trees in unfrequented places; lays five or six blueish eggs with black stripes and spots; when domesticated feeds on all kinds of grain; and though very destructive to plantations, clears them in a considerable degree from noxious insects, on which account the breed has of late years been encouraged in the West Indies.

5. G. sturvina. Hoary; black on the crown and back; between the wings violet-black; tail and wings with a shade of green; the latter with a double white stripe. Female dirty ash; back brown; wings and tail deep-black. Inhabits the ozier banks of Dauria; in its nest and eggs resembles the thrush.

GRACULUS, in ornithology. See CORVUS.

GRADATION, in general, the ascending step by step, or in a regular and uniform manner. Thus it denotes in logic a form of reasoning, otherwise called Sorites; in painting, a gradual and insensible change of colour, by the diminution of the tints and shades. In rhetoric, it denotes the same with Climax.

GRA'DATORY. *s.* (*gradus*, Latin.) Steps from the cloister into the church (*Ainsw*).

GR'ADIENT. *a.* (*gradiens*, Lat.) Walking; moving by steps (*Wilkins*).

GRADISCA, a town of Sclavonia, on the frontiers of Croatia, seated on the Save. Lat. 45. 21 N. Lon. 18. 39 E.

GRADISCA, a strong town of Germany, in the county of Goritz. Lat. 46. 6 N. Lon. 13. 14 E.

GRADO, in music, signifies degree. Thus, di grado is used to denote music, the notes of which rise or fall gradually from a space to its contiguous line, or from a line to its nearest space.

GRADUAL, GRADUALE, was anciently a church-book, containing divers prayers, rehearsed, or sung, after the epistle. After reading the epistle, the chantor ascended the ambo with his gradual, and rehearsed the prayers, &c. therein; being answered by the choir: whence the name gradual, on account of the steps or degrees of the ambo.

In the Romish church, the word gradual is still frequently used in the same sense.

GRADUAL, GRADUALIS, is also applied to the fifteen psalms sung among the Hebrews on the fifteen steps of the altar.

GRA'DUAL. *a.* (*graduel*, French.) Proceeding by degrees; advancing step by step (*Milton*).

GRA'DUAL. *s.* (*gradus*, Latin.) An order of steps (*Dryden*).

GRADUA'LITY. *s.* (from *gradual.*) Regular progression (*Brown*)

GRA'DUALLY. *ad.* (from *gradual.*) By degrees; in regular progression (*Newton*).

To GRA'DUATE. *v. a.* (*graduer*, French) 1. To dignify with a degree in the university (*Carew*). 2. To mark with degrees (*Derham*). 3. To raise to a higher place in the scale of metals: a chymical term (*Bacon*). 4. To heighten; to improve (*Brown*)

GRA'DUATE. *s.* (*gradué*, French.) One dignified with an academical degree, as a bachelor of arts, bachelor of laws, bachelor of divinity, master of arts, doctor, &c.

GRADUA'TION *s.* (*graduation*, French.) 1. Regular progression by succession of degrees (*Grew*). 2 Exaltation of qualities (*Brown*). 3. The act of conferring academical degrees.

GRADUATION OF MATHEMATICAL INSTRUMENTS, is the process by which the arches of quadrants, theodolites, circular instruments, &c. are divided into degrees, and the minuter subdivisions. This is a branch of practical mechanics, which has been cultivated by the ingenious with great assiduity for more than a century; Hooke, Sharpe, Graham, Bird, Ramsden, Smeaton, Hindley,

and Troughton, being among the artists who have most distinguished themselves in producing the successive improvements. To trace the progression of their various methods with such minuteness and perspicuity as would be of real utility to the practical mechanic would lead us far beyond our narrow limits: we can only, therefore, refer the reader to Mr. Smeaton's paper in the Philosophical Transactions, vol. lxxvi. (New Abridgement, vol. xvi. p. 30—76), and to Mr. Troughton's, in the Phil. Transac. for 1809, Part I. for the most ample information on this curious subject which has yet been published; and which, indeed, comprise together as well a history of all that has been done, as a clear description of the best methods.

GRAFF. *s.* A ditch; a moat (*Clarendon*).

GRAFF. GRAFT. *s.* (*greffe*, French.) A small branch inserted into the stock of another tree, and nourished by its sap, but bearing its own fruit; a young cion (*Pope*).

To GRAFF. *To* GRAFT. *v. a.* (*greffer*, French.) 1. To insert a cion or branch of one tree into the stock of another (*Dryden*). 2. To propagate by insertion or inoculation. 3. To insert into a place or body to which it did not originally belong (*Romans*). 4. To fill with an adscititious branch (*Shaks.*). 5. To join one thing so as to receive support from another (*Swift*).

GRAFFIO, in our old writers, a landgrave or earl.

GRAFIGNY (Frances), a French lady, author of the Peruvian Letters, which have been translated into every European language, was the wife of a chamberlain of the duke of Lorrain. After the death of her husband she went to Paris with mademoiselle de Guise, where she was greatly admired and caressed for her talents, and where she died in 1758, at the age of 65.

GRA'FTER. *s.* (from *graff* or *graft.*) One who propagates fruit by grafting (*Evelyn*).

GRAFTING, or ENGRAFTING, in gardening, is the insertion of a shoot or scion of one plant into the stock or stem of another, so that both may unite and become one tree. The same process has been occasionally resorted to in zoology, sometimes for mere sport or curiosity, and sometimes for purposes of real utility. Thus the spur of a cock has been sometimes cut off and inserted into the ligaments upon his head: and thus a sound tooth from one person has been extracted and inserted into the gum and socket of another upon the removal of a diseased tooth. The formative principle of the blood in both animals and vegetables produces new vessels, and the adventitious substance becomes a part of the general system: but it is never so completely assimilated to its general system as its innate members; and hence, in animal life, in a variety of diseases in which the general crasis of the fluids is attenuated, as in sea-scurvy for example, the new connection is often destroyed, and the adventitious part drops off. In some, and perhaps similar diseases of trees, though the graft be not so far loosened as to drop off, the connection between itself and the original stock seems to be so considerably affected as to render its branches incapable of farther fructification. In the choice of grafts, the following observations are well worth attending to. We should be careful, 1st. That they are shoots of the former year. 2dly. That they are taken from healthy fruitful trees. And, 3dly, from the lateral or horizontal branches, and not from the perpendicular shoots. These grafts should be cut off from the trees before the buds begin to swell, which is generally three weeks or a month before the season for grafting; and hence, when cut off, they should be laid in the ground with the cut downwards, burying them half their length, and covering their tops with dry litter, to prevent their drying: if a small joint of the former year's wood be cut off with the scion, it will preserve it the better; and when it is grafted this may be removed; for the grafts must be cut to a proper length before they are inserted into the stocks; but till then, the shoots should remain their full length, as they were taken from the tree, which will preserve them better from striking. If these grafts be to be carried to a considerable distance, it will be proper to put their cut ends into a lump of clay, and to wrap them up in moss, which will preserve them fresh for a month at least: but these should be cut off earlier from the trees than those which are not to be carried to a distance.

The use of grafting is to propagate any curious sort of fruit, so as to be certain of the kind; which cannot be done by any other method: for as all our good fruits have been actually obtained from seeds, the seeds of these, when sown, will often degenerate, and produce such fruits as are not worth cultivating: but when shoots are taken from such trees as produce good fruit, these will never alter from their kind, whatever be the stock or tree on which they are grafted; for, though the grafts receive their nourishment from the stocks, they are never varied by them, but continue to produce the same kind of fruit as the tree from which they were taken.

General directions for Grafting.—All such trees as are of the same genus, i. e. which agree in their flower and fruit, will take upon each other; for instance, all nut-bearing trees may be safely grafted on each other; as may also the plum-bearing trees, under which head may be reckoned not only the several sorts of plums, but also the almond, peach, nectarine, apricot, &c. which agree exactly in their general characters, by which they are distinguished from all other trees: but many of these are very subject to emit large quantities of gum from such parts of them as are deeply cut and wounded, which, in the tender trees of this kind, viz. peaches and nectarines, being extremely hurtful, it is the best method in such cases to bud or inoculate them. See INOCULATION.

All such trees as bear cones will do well upon each other, though they may differ in

one being ever-green, and the other shedding its leaves in winter; as is observable in the cedar of Lebanus and the larch tree, which are found to succeed upon each other very well: but these must be grafted by approach; for they abound with a great quantity of rosin, which is apt to evaporate from the graft, if separated from the tree before it be joined by the stock, whereby they are often destroyed; so also should we act with the laurel on the cherry, or the cherry on the laurel. Again, all the mast-bearing trees will take upon each other, and those which have a tender soft wood will do well if grafted in the common way; but those of a more firm contexture, and that are slow growers, should be grafted by approach.

By strictly observing this rule we shall seldom miscarry, provided the operation be rightly performed and at a proper season, unless the weather should prove very unfavourable. It is by this method that many exotics are not only propagated, but also rendered hardy enough to endure the cold of our own climate in the open air; for being grafted upon stocks of the same sort that are hardy, the grafts are rendered more capable of enduring the cold; as has been experienced in most of our valuable fruits now in England, which were formerly transplanted hither from more southerly climates. Prior to grafting we should be provided with a small hand-saw, to cut off the heads of large stocks, a good strong knife with a thick back, to make clefts in the stocks; a sharp penknife to cut the grafts; a grafting chisel, and a small mallet: bass strings, or woollen yarn; and a quantity of clay, which should be prepared a month before it is used, in the following manner. Get some strong, fat loam; then take some new horse-dung, and break it in amongst the loam; if you cut a little straw or hay very small, and mix amongst it, the loam will hold together the better; and if there be a quantity of salt added, it will prevent the clay from dividing in dry weather; this compost should be well intermixed like mortar, with a sufficiency of water added to it; after which it should be moistened afresh, and stirred every other day; but it should not be exposed to the frosts, or to drying winds. Of late years, some have made use of another composition for grafting, which they have found to answer the intention of keeping out the air better than the clay just prescribed: this is composed of turpentine, bees-wax, and rosin, melted together; which, when of a proper consistence, may be put on the stock round the graft, in the same manner as the clay is usually applied; and though it be not above a quarter of an inch thick, it will resist the air more effectually than the clay; and as the cold will harden it, there is no danger of its being hurt by frost, which is very apt to make the clay separate and sometimes fall of; and when the heat of summer returns, this mixture will melt away without any trouble; but be careful not to apply it too hot, lest you injure the graft.

There are several ways of grafting, the principal of which are the following:

Grafting in the rind, called also crown-grafting, and shoulder-grafting, is only proper for large trees, where either the head or the large branches are cut off horizontally, and two or four scions are put in, according to the size of the branch or stem: in doing this the scions are cut flat on one side, with a shoulder to rest upon the crown of the stock; then th rind of the stock must be raised up, to admit the scion to enter about two inches between the wood and the bark of the stock, so that the shoulder of the scion may meet, and closely unite with the crown of the stock; and after the number of scions are inserted, the whole crown of the stock should be well clayed over, leaving two eyes of the scions uncovered. This method of grafting was formerly much more in practice than at present: its discontinuance was occasioned by the ill success with which it has been attended, from the scions being frequently blown out by strong winds, after they had made large shoots; which has sometimes happened after they have had five or six years growth; so that whenever this method is practised, there should be stakes fastened to support the scions till they have almost covered the stock. The latter end of March, or the beginning of April, is the best time for this process.

Cleft-Grafting, termed also stock or slit-grafting, is practised upon stocks or trees of a smaller size, from an inch to two inches or more in diameter, and may be used with success where the rind of the stock is not too thick. This method of grafting is to be performed in the months of February and March; and in doing it, the head of the stock or branch must be cut off with a slope, and a slit made the contrary way in the top of the slope, deep enough to receive the scion, which should be cut sloping like a wedge, so as to fit the slit made in the stock, being careful to leave that side of the wedge which is to be placed outward much thicker than the other; and in putting the scion into the slit of the stock, care must also be taken to join the rind of the scion to that of the stock; for if these do not unite, the grafts will not succeed: when this mode of grafting is applied to stocks which are not strong, it will be proper to make a ligature of brass to prevent the slit of the stock from opening: then the whole should be clayed over, to prevent the air from penetrating the slit, so as to destroy the grafts; only leaving two eyes of the scions above the clay for shooting.

Whip-Grafting, called also tongue-grafting, is more commonly practised than any other by the nurserymen near London, especially for small stocks, because the scions much sooner cover the stocks in this method than in any other. This is performed by cutting off the heads of the stocks sloping; there must then be a notch made in the slope toward the upper part downwards, a little more than half an inch deep, to receive the scion, which must

be cut with a slope upward, and a part left in this slope like a tongue; which tongue must be inserted into the slit made in the slope of the stock, so as that the two rinds of both scion and stock may be equal and join together exactly; there should then be a ligature of bass to fasten the scion, so as that it may not be easily displaced; and afterwards it should be clayed over, as in the former methods.

Root-Grafting, consists in grafting a fine fruitful branch upon a root. The manner of performing it is to take a graft of the tree designed to be propagated, and a small piece of the root of another tree of the same kind, or very near it, or pieces of roots cut from the tree transplanted, and whip-graft them, binding them well together. This tree may be planted where it is to stand, for the piece of root will draw sap and feed the graft, as the stock does in the other methods.

Grafting *by approach*. See Inarching.

Grafting (Escutcheon). See Inoculation.

GRAHAM (George), clock and watch maker, the most ingenious and accurate artist of his time, was born in 1675. After his apprenticeship Mr. Tompion received him into his family, purely on account of his merit; and treated him with a kind of parental affection as long as he lived. Beside his universally acknowledged skill in his profession, he was a complete mechanic and astronomer; the great mural arch in the observatory at Greenwich was made for Dr. Halley under his immediate inspection, and divided by his own hand: and from this incomparable original the best foreign instruments of the kind are copies made by English artists. The sector by which Dr. Bradley first discovered two new motions in the fixed stars was of his invention and fabric: and when the French academicians were sent to the north to ascertain the figure of the earth, Mr. Graham was thought the fittest person in Europe to supply them with instruments; those who went to the south were not so well furnished. He was for many years a member of the Royal Society, to which he communicated several ingenious and important discoveries, and regarded the advancement of science more than the accumulation of wealth. He died in 1751.

Graham (Catherine Macaulay), an English authoress of some note, who wrote a history of England from James I. to the Brunswick line: a treatise on the Immutability of Truth; Letters on Education; and other works. She died in 1791.

GRAIL. *s.* (from *grêle*, French.) Small particles of any kind (*Spenser*).

GRAIN *s.* (*grain*, French; *granum*, Lat.) 1. A single seed of corn (*Shakspeare*). 2. Corn (*Dryden*). 3. The seed of any fruit. 4. Any minute particle; any single body (*Shaks.*). 5. The smallest weight, of which in physic twenty make a scruple, and in Troy weight twenty-four make a pennyweight; and so named because it is supposed of equal weight with a grain of corn (*Holder*). 6. Any thing proverbially small (*Wisdom*). 7. Grain *of allowance*. Something indulged or remitted (*Watts*). 8. The direction of the fibres of wood, or other fibrous matter (*Shakspeare*). 9. The body of the wood as modified by the fibres (*Dryden*). 10. The body considered with respect to the form or direction of the constituent particles (*Brown*). 11. Died or stained substance (*Spenser*). 12. Temper; disposition; inclination (*Hudibras*). 13. The heart; the bottom (*Hayward*). 14. The form of the surface with regard to roughness and smoothness (*Newton*).

Grain (Jean Baptist le), a French historian, counsellor, and master of the requests to Mary de Medicis queen of France, was born in 1565, and died in 1643. By a clause in his will he directed that none of his descendents should entrust the education of their children to the jesuits. His Decades contain the History of Henry IV. and the History of Lewis XIII. to the death of the marshal d'Ancre.

Grain Coast, or Malaguetta, or Pepper Coast, a country of Guinea, bounded by the Sierra Leona country, which lies to the west, and the Ivory Coast, on the southeast, extending along the Atlantic, about 100 leagues. The climate is said to be unwholesome, especially to Europeans. The productions are peas, beans, gourds, lemons, oranges, and a kind of nut, with an exceedingly thick shell, a most delicious fruit, for which neither Europeans or natives have a name. The palm wine and dates of this country are in the greatest esteem. Cows, hogs, sheep, and goats, are also in great plenty; but what constitutes the chief wealth of the Grain Coast is the abundance of Guinea pepper, or grains of Paradise, it produces, called Malaguetta by the Portuguese, which draws a great trade, not only with all the neighbouring interior nations but with the Europeans also. The natives of this division are guilty of no excesses in eating or drinking, or indeed of intemperance in any kind of luxury.

Grain (Scarlet), in botany. See Quercus.

Grains of Paradise. See Amomum and Cardamomum.

GRAINING, in ichthyology. See Cyprinus.

GRAI'NED. *a.* (from *grain.*) Rough; made less smooth (*Shakspeare*).

GRAINS. *s.* (without a singular.) The husks of malt exhausted in brewing (*B. Jon.*).

GRAI'NY. *a.* (from *grain.*) 1. Full of corn. 2. Full of grains or kernels.

GRAKLE, in ornithology. See Gracula.

GRAMAT, a town of France, in the department of Lot. Lat. 44. 47 N. Lon. 1. 37 E.

GRAMEN CANINUM. Dog's grass. Couch grass. Triticum repens of Linnéus. The roots are agreeably sweet, and possess aperient properties. The expressed

juice is recommended to be given largely. See TRITICUM.

GRAME'RCY. *interj.* (contracted from *grant me mercy*.) An obsolete expression of surprise.

GRAMINA. Grasses. The fifth family, and the second nation, tribe or cast in Linnéus's General Division of the Vegetable Kingdom. The fourteenth order in the Fragments of a Natural Method in Philos. Botan. —and the fourth of the Natural Orders at the end of Genera Plantarum.—In the Artificial System, most of the grasses are contained in the second order of the fifth class.

GRAMINEA, in antiquity, is applied to a crown formed of grass, *gramen*, bestowed by the Romans on certain of their generals, in consideration of their having saved or rescued an army.

GRAMI'NEOUS. *a.* (*gramineus*, Lat.) Grassy.

GRAMINI'VOROUS. *a.* (*gramen* and *voro*, Latin.) Grass-eating (*Sharp*).

GRA'MMAR. *s.* (*grammaire*, French; *grammatica*, Latin.) 1. The science of speaking correctly; the art which teaches the relations of words to each other (*Locke*). 2. Propriety or justness of speech (*Dryden*). 3. The book that treats of the various relations of words to one another.

GRAMMAR is the art of rightly expressing our thoughts by words.

Grammar in general, or universal grammar, explains the principles which are common to all languages.

The grammar of any particular language, as the English grammar, applies those common principles to that particular language, according to the established usage and custom of it.

Grammar treats of sentences; and of the several parts of which they are compounded.

Sentences consist of words; words, of one or more syllables; syllables, of one or more letters.

So that letters, syllables, words, and sentences, make up the whole subject of grammar.

INTRODUCTION.

A letter is the first principle, or least part, of a word.

An articulate sound is the sound of the human voice, formed by the organs of speech.

A vowel is a simple articulate sound, formed by the impulse of the voice, and by the opening only of the mouth in a particular manner.

A consonant cannot be perfectly sounded by itself; but joined with a vowel forms a compound articulate sound, by a particular motion or contact of the parts of the mouth.

A diphthong, or compound vowel, is the union of two or more vowels pronounced by a single impulse of the voice.

By means of inarticulate sounds beasts can express certain feelings, but man is distinguished from the brute creation by the power of modifying a much greater variety of sounds, and of fixing to each modification a particular meaning. The sounds thus modified are called words; and as words have no natural relation to the ideas and perceptions of which they are significant, the use of them must either have been the result of human sagacity, or have been suggested to the first man by the Author of nature.

Since it does not appear that any language has been formed by determinate rules, and each has been subject to different degrees of cultivation, they will all have their respective excellencies and defects. In determining these excellencies and defects, we may expect to meet with much altercation; and, according to the notions derived from the country which gave us birth, or the language which it was our chance to study, we shall form probably a standard for all countries. In Europe we are much attached to the structure of the Greek language. In the East the grammars are formed chiefly on the plan of the Arabic.

In expressing our thoughts, some object must be denoted by a sound, of which we affirm something. Thus, gold is heavy. *Gold* is the object; *is* denotes existence, and *heavy* is the mode of that existence. The thought may be dilated thus: Gold is heavier than lead. Where the thing affirmed is, that it is heavier than lead: and a new object is introduced with sounds to denote comparison; *er*, or more than. From the various modes used by different nations to express the property affirmed of any object, great disputes have arisen, not only on the different sorts of words necessary to constitute a language, but on the sorts of words actually existing in a given language. Thus, some writers affirm that language requires only two sorts of words; and others have written grammars for the use of children, which lay down ten sorts of words in the English langua each class being distinguished by some name derived from the Latin. Though it appears to us that words might be more commodiously distributed into the general divisions of name, and attribute or property, yet, as the Latin language has obtained universal authority, we shall bow to the established practice, and treat of words under the accustomed division, into Noun, Article, Pronoun, Verb, Participle, Adverb, Preposition, Conjunction, and Interjection.

CHAPTER I.

Of the Noun or Substantive.

Nouns are all those words by which objects or substances are denominated, and which distinguish them from one another, without marking either quantity, quality, action, or relation. The substantive or noun is the name of the thing spoken of, and in Greek and Latin is called name; for it is ονομα in the one, and nomen in the other; and if in English we had called it the name rather than the noun, the appellation would have been more proper. That nouns or the names of things must make a part of every language, and that they must have been the words first suggested to the human mind, will not be disputed. Men could not speak of themselves or of any thing else, without having names for themselves and the various objects with which they are surrounded. Now, as all the objects which exist must be either in the same state in which they were produced by nature, or changed from their original state by art, or abstracted from substances by the powers of imagination, and conceived by the mind as having at least the capacity of being characterized by qualities; this naturally suggests a division of nouns into *natural*, as man, vegetable, tree, &c. *artificial*, as house, ship, watch, &c. and *abstract*, as whiteness, motion, temperance, &c.

But the diversity of objects is so great, that had each individual a distinct and proper name, it would be impossible for the most tenacious memo-

ry, during the course of the longest life, to retain even the nouns of the narrowest language. It has therefore been found expedient, when a number of things resemble each other in some important particulars, to arrange them all under one species; to which is given a name that belongs equally to the whole species, and to each individual comprehended under it. Thus the word *man* denotes a species of animals, and is equally applicable to every human being: the word *horse* denotes another species of animals, and is equally applicable to every individual of that species of quadrupeds; but it cannot be applied to the species of men, or to any individual comprehended under that species. We find, however, that there are some qualities in which several species resemble each other; and therefore we refer them to a higher order called a *genus*, to which we give a name that is equally applicable to every species and every individual comprehended under it. Thus, men and horses and all living things on earth resemble each other in this respect, that they have life. We refer them therefore to the genus called *animal*; and this word belongs to every species of animals, and to each individual animal. The same classification is made both of artificial and abstract substances; of each of which there are genera, species, and individuals. Thus, in natural substances, animal, vegetable, and fossile, denote *genera*; man, horse, tree, metal, are *species*; and Alexander, Bucephalus, oak, gold, are *individuals*. In artificial substances, edifice is a *genus*; house, church, tower, are *species*; and the Vatican, St. Paul's, and the Tower of London, are *individuals*. In abstract substances, motion and virtue are *genera*; flight and temperance are *species*; the flight of Mahomet, and temperance in wine, are *individuals*. By arranging substances in this manner, and giving a name to each genus and species, the nouns necessary to any language are comparatively few, and easily acquired: and when we meet with an object unknown to us, we have only to examine it with attention; and, comparing it with other objects, to refer it to the genus or species which it most nearly resembles. By this contrivance we supply the want of a proper name for the individual; and so far as the resemblance is complete between it and the species to which it is referred, and of which we have given it the name, we may converse and reason about it without danger of error: whereas, had each individual in nature a distinct and proper name, words would be innumerable and incomprehensible; and to employ our labours in language would be as idle as that study of numberless written symbols which distinguishes the Chinese.

Although nouns are thus adapted to express not the individuals, but the genera or species into which substances are classed; yet, in speaking of these substances, whether natural, artificial, or abstract, all men must have occasion to mention sometimes one of a kind, and sometimes more than one. In every language, therefore, nouns must admit of some variation in their form, to denote unity and plurality; and this variation is called *number*. Thus in the English language, when we speak of a single place of habitation, we call it a *house*; but if of more we call them *houses*. In the first of these cases the noun is said to be in the singular, in the last case it is in the plural number. Greek nouns have also a dual number to express two individuals, as have likewise some Hebrew nouns: but this variation is evidently not essential to language; and it is perhaps doubtful whether it ought to be considered as an elegance or a deformity.

But although number be a natural accident of nouns, it can only be considered as essential to those which denote genera or species. Thus we may have occasion to speak of one animal or of many animals, of one man or of many men; and therefore the nouns *animal* and *men* must be capable of expressing plurality as well as unity. But this is not the case with respect to the proper names of inviduals: for we can only say Xenophon, Aristotle, Plato, &c. in the singular; as, were any one of these names to assume a plural form, it would cease to be the proper name of an individual, and become the common name of a species. Thus, we say the Cæsars; the Howards, the Pelhams, the Montagues, &c.: but Socrates can never become plural, so long as we know of no more than one man of that name.

Besides number, another characteristic visible in substance is that of *sex*. Every substance is either male or female; or both male and female; or neither one nor the other. With regard to this great natural characteristic grammarians have made only a threefold distinction of nouns: those which denote males are said to be of the masculine gender: those which denote females, of the feminine: and those which denote substances, that admit not of sex, are said to be neuter, or of neither gender. All animals have sex: and therefore the names of all animals should have gender. But the sex of all is not equally obvious, nor equally worthy of attention. In those species that are most common, or of which the male and the female are, by their size, form, colour, or other outward circumstances, eminently distinguished, the male is sometimes called by one name, which is masculine; and the female by a different name, which is feminine. Thus in English we say husband, wife; king, queen; father, mother; son, daughter, &c. In others of similar distinction, the name of the male is applied to the female, only by prefixing a syllable or by altering the termination; as man, woman; lion, lioness; emperor, empress, anciently empeiess; master, mistress, anciently masteress, &c. When the sex of any animal is not obvious, or not material to be known, the same name, in some languages, is applied without variation to all the species, and that name is said to be of the common gender. Thus in Latin *bos albus* is a white ox, and *bos alba* a white cow. Diminutive insects, though they are doubtless male and female, seem to be considered in the English language as if they were really creeping things. No man, speaking of a worm, would say *he creeps*, but *it creeps*, upon the ground. But, although the origin of genders is thus clear and obvious, yet the English is the only language with which we are acquainted that deviates not, except in this single instance of insects, from the order of nature. Greek and Latin, and many of the modern tongues, have nouns, some masculine, some feminine, which denote substances where sex never had existence. Nay, some languages are so particularly defective in this respect, as to class every object, inanimate as well as animate, under either the masculine or the feminine gender, as they have no neuter gender for those which are of neither sex. This is the case with the Hebrew, French, Italian, and Spanish. But the English, strictly following the order of nature, puts every noun which denotes a male animal, and no other, in the masculine gender; every name of a female animal, in the feminine; and every animal, whose

sex is not obvious or known, as well as every inanimate object whatever, in the neuter gender. *And this gives our language an advantage above most others in the poetical and rhetorical style*: for, when nouns naturally neuter are converted into masculine and feminine, the personification is more distinctly and more forcibly marked.

In some languages there is a variation in the noun, called by grammarians *case*. The Latin has five cases, the Greek four, the German three, the English one, the Hebrew none. From this difference in the use of cases, it is evident that they are not to be considered as essential in language. In English the variation in the ending of the noun expresses possession: and hence it is called the *possessive case*. Thus, from *God* we have, for the possessive case, *God's*; by thus adding *s* or *is* to the name, we express a connection between him and some other object then spoken of. Thus, *God's house* implies the house belonging to God: and old writers frequently used the word *his*, which may have given rise to the case: thus, *God his house*. In the Hebrew this connection is expressed by the mere position of the two words.

For other relations of one thing to another, we use prepositions: thus, *to*, *from*, *by*, which relations in other languages are expressed by a change in the end of the noun, and this change derives its origin probably from some suffix which had the force of our preposition.

CHAPTER II.

On Articles or Definitives.

Many and severe have been the disputes among grammarians upon the use and meaning of these little words. Reasoning oftentimes from a metaphor, they persuade themselves at last that they have made some notable discovery; and because in a building there must be joints and nails, we must have in language little words or pegs to keep all things together. Thus Mr. Harris, whose knowledge was derived from the Greek language and Greek grammarians, and whose principles, as is natural from knowledge founded on so narrow a basis, are contradicted by the slightest acquaintance with the Teutonic and Arabic, leads us through many a maze; and we might have wandered till this moment, if Mr. Tooke, in his excellent work on the word *that*, enlarged in his Epea Pteroenta, had not pointed out to us the open and straight road of etymology, when we can travel upon it, and, when that fails us, of analogy. In the English language we call the words *a* and *the* articles: the Germans have *ein* and *der*: the French *un* and *le*: the Greeks ὁ: the Hebrews, ה: but the unfortunate Latins are said to be without these joints and pegs in speech. But if one language is without them, they are, it is evident, not essential to language: and it will be found difficult to make such a definition as shall exclude a variety of words, such as, *his*, *this*, *that*, &c. from making a part of this division.

In the languages above mentioned the precise meaning of the words, *the der le*, ὁ, and ה, cannot at first sight be ascertained. The Engilsh word *a* points obscurely to its meaning. The German *ein* and the French *un* clear the road for investigation. They are to be found continually applied to substantives, and mean *one*: for it is obvious that in common conversation we must frequently find it necessary to limit the object of it to one of a species. As the object must sometimes be limited, at others this limitation may not be necessary; and it is curious to observe how different nations express the same idea. Thus if a thing is generally reported, we say in English "they say," meaning a great number say so: and so in French it is, *on dit*, or *anus dicet*, "one person says," so meaning more than one person by an ellipsis very common in that language: in German it is *man sage*, by man meaning man in general. We have thus found, that in two languages one of the articles is merely a word of number. Probably it may be so in English; *a* may mean *one*, or it is an abbreviation of *any*. By trying the two senses it is evident that *any* cannot be applied in the room of *a*, but that *one* always can: and hence we might conclude that *a* and *an* are only other words for *one*, and answer to the German *ein*.

The article *the*, as it is called, may not discover itself so easily. Yet let us try the same analogy, for the etymology of it is not ascertained. *The* answers to *der* of the Germans, and *le* of the French: but what is *le*? the *ille* of the Latins, and hence we may reasonably presume that our word *the* is no more an article than *ille*, and in fact that it comes from some adjective of the same signification. Let us try by etymology. In German we have *der*, *die*, *das*:[d] which was anciently *ther*, *thia*, (*thie*, *thiu*) *thaz*, and in the plural *thie* (*thier*). This looks very much like our *the*. In the Anglo-Saxon we find *sa seo*, *that*: in Islandic, *sa*, *su*, *that*: in Gothick *sa*, *so*, *thata*: in Hebrew הות הי, הת: etymologists perhaps will not be displeased at our making the words הת and *the* proceed from the same original, and we shall not be afraid of exposing ourselves to the laughter of critics, if we refer the Doric τηνος to the same stock. If we are right in our conjectures, the word *the* is as much a pronoun as the *ille* of the Latins: but, if persons choose to have a distinct class of words under the name of articles, we may say, that the English has two, *a* and *the*, which "serve to define and ascertain any particular object, so as to distinguish it from the other objects of the general class to which it belongs, and of course to denote its individuality."

CHAPTER III.

On Pronouns, or Substantives of the Second Order.

In communicating thoughts, a person must either speak of himself, of the person to whom he is speaking, or of some other persons or things. The word referring to the speaker is called the pronoun of the first person; the word referring to the person spoken to is the pronoun of the second person; the word referring to other persons is the pronoun of the third person. The use of such words is to avoid repetition. "The man speaking says so and so" must be used continually, if the word *I* did not answer the same purpose: in the same manner *thou*, *he*, *she*, *they*, &c. answer similar purposes.

Hence we see why it is improper to say *the I* or *the* THOU; for each of these pronouns has of itself the force of a noun with the definite article prefixed, and denotes a person of whom something is predicated, which distinguishes him from all other persons. *I* is the person who now speaks, *thou* is the person who is now addressed by the speaker. Hence too we see the reason why the pronoun *I* is said to be of the first, and the pronoun *thou* of the second person. These pronouns can have place only in conversation, or when a man, in the character of a public speaker, addresses himself to an audience; but it is obvious, that there must be a speaker before there can be a hearer; and therefore, that the pronouns may follow the order of nature, *I*, which denotes the person of the *speaker*, must take place of *thou*, which denotes the person of the *hearer*. Now the speaker and

the hearer being the only persons engaged in conversation or declamation, *I* is with great propriety called the pronoun of the first, and *thou* the pronoun of the second person. With respect to pronouns, the third person, as it is called, is merely a negation of the other two. This is evident from the slightest attention to the import of those words which are called pronouns of the third person. *He*, *she*, or *it*, denotes not the person either of the speaker or of the hearer; and, as we have just observed, no other person can have a share in conversation or declamation. An absent person or an absent thing may be the subject of conversation, but cannot be the speaker or the person addressed. *He*, *she*, and *it*, however, as they stand by themselves, and assume the power of nouns, are very properly denominated pronouns; but they are not personal pronouns in any other sense than as the negation of sex is the neuter gender.

We have already seen that nouns admit of number; pronouns, which are their substitutes, likewise admit of number. There may be many speakers at once of the same sentiment, as well as one, who, including himself, speaks the sentiment of many: speech may likewise be addressed to many at a time, as well as to one; and the subject of the discourse may likewise be many. The pronoun, therefore, of every one of the persons must admit of number to express this singularity or plurality. Hence the pronoun of the first person *I* has the plural *we;* that of the second person *thou* has the plural *ye* or *you;* and that of the third person *he*, *she*, or *it*, has the plural *they*, which is equally applied to all the three genders.

There is a great deal of caprice in the use of these pronouns in different nations. Thus the English in addressing a person use the second pronoun plural instead of the second singular: the Italians speak in the third person singular of the person spoken to; and the Germans, from the ridiculous notions which they entertain of birth, and the servile state into which in consequence their minds have been reduced, use the third and the second persons plural, the third and the second persons singular according to the respect which they have for the person addressed. When the second person is used, it is either to God, an object of the greatest familiarity and affection, or as a mark of the utmost contempt or superiority. The pronoun *we* is in general used by a king when speaking of himself: but as he then speaks as an officer of and in the name of the people, this may plead in favour of an abuse of speech.

The pronoun of the third person denoting neither the speaker nor the hearer, but the subject of the discourse, and being merely the substitute of a noun which may be either masculine, feminine, or neuter, must of necessity agree with the noun which it represents, and admit of a triple distinction significant of gender. In English, which allows its adjectives no genders, this pronoun is *he* in the masculine, *she* in the feminine, and *it* in the neuter; the utility of which distinction may be better found in supposing it away. Suppose, for example, that we should in history read these words: "He caused him to destroy him"—and were informed that the pronoun, which is here thrice repeated, stood each time for something different; that is to say, for a man, for a woman, and for a city, whose names were Alexander, Thais, and Persepolis. Taking the pronoun in this manner—divested of its gender—how would it appear which was destroyed, which the destroyer, and which the cause that moved to the destruction? But there is no ambiguity when we hear the genders distinguished: when we are told, with the proper distinctions, that *she* caused *him* to destroy *it*, we know with certainty that the promoter was the woman; that her instrument was the hero; and that the subject of their cruelty was the unfortunate city. From this example we should be surprised how the Italians, French, and Spaniards, could express themselves with precision or elegance with no more than two variations of this pronoun.

Although, in every language with which we are now acquainted, there is but one pronoun for each of the first and second persons; and although it is obvious from the nature and import of those words that no more can be necessary; yet the mere English reader may perhaps be puzzled with finding three distinct words applied to each; *I*, *mine*, and *me*, for the first person, *thou*, *thine*, and *thee*, for the second. The learned reader will see at once that the words *mine* and *me*, *thine* and *thee*, are equivalent to the genitive and accusative cases of the Latin pronouns of the first and second persons. That *mine* is a pronoun in the possessive case is obvious; for if I were asked "whose book is that before me?" I should reply—"It is *mine*;" meaning that it belongs to me. That the word *me* is the same pronoun in the case which the Latin grammarians call the accusative, is evident from the import of that word in the sentence *he admires me*, where the admiration is supposed to proceed from the person spoken of to the person who speaks. It appears therefore, that though English nouns have only two cases, the nominative and possessive, the pronouns of that language have three, as *I*, *mine*, *me; thou*, *thine*, *thee; he*, *his*, *him*, &c. Both pronouns, the Latin and the English, are irregularly inflected: and those words which are called the oblique cases of each were originally derived from nominatives different from *ego* and I; but these nominatives are now lost, and *mei* and *mine* have, beyond all dispute, the effect of the genitives of the Latin and English pronouns of the first person.

From the account here given of the personal pronouns, it appears that the first or second will, either of them, coalesce with the third, but not with each other. For example, it is good sense, as well as good grammar, to say in any language, *I am he—thou art he—we were they—you were they;* but we cannot say—*I am thou*—nor *thou art I*—nor *we are you*, &c. The reason is, there is no absurdity for the speaker to be the subject also of the discourse, as when it is said—*I am he*; or for the person addressed, as when we say, *thou art he*. But for the same person, in the same circumstances, to be at once the speaker and the party addressed, is impossible; for which reason the coalescence of the pronouns of the first and second persons is likewise impossible.

I, *thou*, *he*, *she*, and *it*, are all that are usually called personal pronouns. There is another class of words, which are called sometimes pronominal adjectives, sometimes adjective pronouns, sometimes possessive pronouns; and by one writer of grammar they have been most absurdly termed pronominal articles. It is not worth while to dispute about a name; but the words in question are *my*, *thy*, *her*, *our*, *your*, *their*. These words are evidently in the form of adjectives: for, like other English adjectives, they have no variation to indicate either gender, number, or case; and yet they are put in concord with nouns of every gender and both numbers, as *my wife*, *m son*, *my book—her husband*, *her sons*, *her daughters*, &c. But, though in the form of adjectives, they have the

power of the personal pronouns in the possessive case: *my book* is the book of *me*, or the book of *him who now speaks*; *our house* is the house of *us*, or the house occupied by the *persons who now speak*; *her husband* is the husband of a woman who can be known only from something preceding in the discourse; and *their property* is the property of them—of any persons, whether men or women, or both, who have been previously mentioned. Words which have the form of adjectives, with the power of pronouns, may, without impropriety, be called pronominal adjectives; and such is the name by which we shall henceforth distinguish them. To these pronominal adjectives, as well as to the personal pronouns, are subjoined the words *own* and *self*—in the plural *selves*; in which case they are emphatical, and imply a silent contrariety or opposition. Thus, *I live in my own house*; that is, not in a hired house. *This I did with my own hand*; that is, not by proxy. *This was done by myself*, that is, not by another. The word *self* subjoined to a personal pronoun forms also the reciprocal pronoun; as, *We hurt ourselves by vain rage; he blamed himself for his misfortune. Himself, itself, themselves*, are supposed by Wallis to be put, by corruption, for *his self, its self, their selves*; so that *self* is always a substantive or noun, and not a pronoun. This seems to be a just observation: for we say, *the man came himself; they went themselves*; where the words *himself* and *themselves* cannot be accusatives but nominatives, and were anciently written *his self, their selves*.

There are other words which are usually ranked under the class of pronouns; as *who, which, what*. These, when employed in asking questions, are called interrogative pronouns; though a name more characteristic might surely be found for them. Their import, however, will be more easily ascertained after we have considered another species of pronouns, which have been denominated *relatives*, and with which they are intimately connected.

The pronouns already mentioned may be called prepositive, as may indeed all substantives, because they are capable of introducing or leading a sentence: but there is another pronoun which has a character peculiar to itself; and which, as it is never employed but to connect sentences, and must therefore have always a reference to something preceding, is called the subjunctive or relative pronoun. This pronoun is in Greek, ὁς, ἡ, ὁ; in Latin, *qui, quæ, quod*; and in English, *who, which, that*.

In order to determine with precision the nature and import of the relative pronoun, it will be necessary to ascertain the powers which it contains, or the parts of speech into which it is capable of being resolved. Now it is obvious, that there is not a single noun, or prepositive pronoun, which the relative is not capable of representing: for we say, I, *who* saw him yesterday, cannot be mistaken; *you, who* did not see him, may have been misinformed; *they, who* neither saw nor heard, can know nothing of the matter; *the things, which* he exhibited, were wonderful. From these examples it is apparent, in the first place, that the relative contains in itself the force of any other pronoun: but it contains something more.

If from any sentence in which there is a relative, that relative be taken away, and the prepositive pronoun, which it represents, be substituted in its stead, the sentence will lose its bond of union, and stand quite loose and unconnected. Thus, if instead of saying *the man is wise who speaks little*, we should say *the man is wise, he speaks little*, the sentence would be resolved into two; and what is affirmed of the man's wisdom would have no connection with the circumstance of his speaking little. Hence it is evident, in the second place, that the relative contains the force of a connective as well as of the prepositive pronoun. What kind of connection it denotes is next to be ascertained.

It may be laid down as a general principle, "that, by means of the relative pronoun, a clause of a sentence, in which there is a verb, is converted into the nature of an adjective, and made to denote some attribute of a substance, or some property or circumstance belonging to the antecedent noun." Thus, when it is said *homo qui prudentia præditus est*, the relative clause—*qui prudentia præditus est*, expresses nothing more than the quality of prudence in concrete with the subject *homo*, which might have been equally well expressed by the adjective *prudens*.

Now if a relative clause expresses that which might be expressed by an adjective, the presumption is, that it may be resolved into the same constituent parts. But every adjective contains the powers of an abstract substantive, together with an expression of connection; and may be resolved into the genitive case of that substantive, or into the nominative with the particle *of* prefixed, which in English corresponds to the termination of the genitive in the ancient languages. That the member of a sentence, in which there is a relative, may, in every instance, be analysed in the same manner, will be apparent from the following examples. *Vir qui sapit, vir sapiens*, and *vir sapientiæ*; "a man who is wise, a wise man, and a man of wisdom;" are certainly phrases of the same import. Again, *homo, cui ingratus est animus, malus fit amicus*, may be translated into Greek, ἀνθρωπος ἀχαριςιας κακος γινεται φιλος; and into English, "the man of ingratitude is a bad friend."

Thus then it appears, that the relative pronoun contains in itself the force of the prepositive pronoun, together with that connection implied in English by the preposition *of*, and in the ancient languages by the genitive case. When one says, *vir sapit qui pauca loquitur*, the relative clause *qui pauca loquitur* expresses that attribute of the man from which his wisdom is inferred: it is conceived by the mind as stript of its propositional form, and standing in the place of a substantive noun governed in the genitive case by *vir*. The whole sentence might be thus translated, "the man of *little speaking* is wise;" or, did the use of the English language admit of it, "the man *of he speaks little* is wise."

We are sensible, that these expressions will appear extremely uncouth and offensive; but we mean not to recommend them as common modes of phraseology. Against their being employed as such, present use loudly remonstrates. They are introduced only with a view to show the true import of the relative pronoun; and for that purpose they are well adapted. That pronoun seems to be of use only when there is a deficiency of adjectives or substantives to denote some complex attribute by which we want to limit a general term or expression. Where such adjectives or substantives exist in language, we may indeed use the relative or not at pleasure. Thus we say, *homo qui grandia loquitur*, or *homo grandiloquus*; because the adjective and the relative clause are perfectly of the same meaning. But if the Latins were called upon to translate ἀνθρωπος αυτοδιδακτος, we believe they must have made use of the relative pronoun.

as we know not any correspondent adjective in their language.

Some persons have supposed that the relative is equivalent to another pronoun, together with an expression of connection of that kind which is denoted by the particle *and*

But the absurdity of this opinion will appear from the following sentence: "Charles XII. was the only monarch who conquered kingdoms to bestow them on his friends." Here it is evident there is but one proposition, of which the predicate is expressed by the words—"only monarch who conquered kingdoms to bestow them on his friends;" so that the relative clause is a necessary part of the predicate, and has, like an abstract noun in the genitive case, the effect of modifying the general term *monarch*. Resolve this sentence, and you have two propositions, of which the first is a notorious falsehood:—"Charles XII. was the *only monarch*; *and he* conquered kingdoms to bestow them on his friends." But instead of *and* substitute *of*—saying, "Charles XII. was the only monarch *of he conquered kingdoms to bestow them on his friends*;" and you preserve the true import of the expression.

Are there no cases, then, in which the relative may be resolved into the connective *and* with a prepositive pronoun? Undoubtedly there are, and we shall now endeavour to ascertain them.

Adjectives in language have two different effects upon the substantives to which they belong, according to the nature of the attribute which they express. If the attribute expressed by the adjective be competent to all the species of which the substantive is the specific name, it is plain that the adjective does not modify or limit the substantive, for this obvious reason, that nothing can modify which is not discriminative. Thus, when Horace says, "Prata canis albicant pruinis," the adjective *canis* denotes a quality common to all hoarfrost; and therefore cannot modify the substantive, because it adds nothing to the conception of which that substantive is the name. But when the attribute expressed by the adjective is competent to some individuals only of the species of which the substantive is the name, the adjective has then the effect of modifying or limiting the substantive. Thus, when one says *vir bonus*, he makes use of an adjective which modifies the substantive *vir*, because it expresses a quality or attribute which does not belong to all men.

The clause of a sentence in which there is a relative, as it is in every other respect, so is it in this, equivalent to an adjective; it either modifies, or does not modify, the antecedent, according as the attribute which it expresses is or is not characteristic of the species to which the antecedent belongs. Thus, when it is said, "Man, who is born of a woman, is of few days and full of trouble," the relative clause—*who* is born of a woman, expresses an attribute common to all men, and therefore cannot modify. In like manner, when we say —"*Socrates*, who taught moral philosophy, was virtuous,"—the clause, *who* taught moral philosophy, does not modify. In both these instances the relative clause might be omitted; and it might be said with equal truth, "Man is of few days and full of trouble,"—and "*Socrates* was virtuous."

But if it be said, *vir sapit qui pauca loquitur*, the relative clause—*qui pauca loquitur*, modifies the antecedent *vir*; for it is not affirmed of every man, that he is wise, but only of such men as speak little. So—"Charles XII. was the only monarch who conquered kingdoms to bestow them on his friends;" and, "the man that endureth to the end shall be saved;" with many more examples that will occur to every reader.

Now it will be found, that it is only when the relative clause expresses such a property or circumstance of the antecedent as does not limit its signification, that the relative pronoun can be resolved into a prepositive pronoun with the conjunction *and*, and that in these cases the relative clause itself is of very little importance. Thus in the assertion—"Charles XII. was the only monarch who conquered kingdoms to bestow them on his friends,"—where the relative clause is restrictive, the *who* cannot be resolved into *and he* consistently with truth or common sense. But in the expression, "Man, who is born of a woman, is of few days and full of trouble," the relative *who* may be so resolved, at least without violating truth;—"Man is of few days and full of trouble, and he is born of a woman." The only difference between the sentence with the relative *who*, and the same sentence thus resolved, is, that, in the former case, it contains but one predication; in the latter two, and these but loosely connected.

Thus then it appears that the general analysis of the relative pronoun is into the particle *of*, and a prepositive pronoun; but that there are also occasions on which it may be resolved into a prepositive pronoun and the particle *and*, without materially altering the sense. Now what is the reason of this distinction?

If the relative clause be equivalent to an adjective or to an abstract substantive in the genitive case, it is easy to see that the relative itself may, in every instance, be resolved into another pronoun and the particle *of*; but it will not perhaps be quite so evident how it should in any instance be resolved by *and*. This last analysis has its foundation in the nature of the particles *of* and *and*; or, to speak more properly, in the nature of the attribute which the relative clause expresses. Both the particles *of* and *and* are used to link or join conceptions together; but with this difference, that *of* has the effect of making the conceptions it connects figure in the mind as one object; whereas the conceptions connected by *and* are still conceived separately as before. To explain ourselves by an example: Suppose we take two words, *man* and *virtue*, which denote two distinct ideas or conceptions, and join them together by the particle *of*, saying *man of virtue*; the mind no longer views them separately as significant of two conceptions, but of one. Take the same words, and join them together by the particle *and*, saying *man and virtue*: the conceptions denoted by *man and virtue* are still viewed separately as two; notice is only given that they are collaterally connected.

This being the case, it follows, that when the relative modifies the antecedent, or, in other words, when the relative clause and the antecedent denote but one conception, the relative must then be resolved by *of*, in order to preserve this unity of conception. But when the relative does not modify the antecedent; that is, when its clause does not express any necessary part of a complex conception; then the conceptions or ideas denoted by the relative clause and the antecedent may be viewed separately as two; and therefore the relative may be resolved into the corresponding prepositive pronoun and the particle *and*.

If the clause of the relative be equivalent to an

adjective, as in every instance it seems to be, it will naturally occur, that in the ancient languages, the relative should agree with its antecedent, in gender, number, and case. They do agree for the most part in gender and number; in case they cannot often, because the very intention of introducing a relative into language is to represent the antecedent in a different case. Whenever we have occasion to use a substantive or noun in a clause of a sentence, and afterwards to express by another clause, in which there is a verb, an attribute of the object denoted by that substantive, we then employ the relative pronoun. Now it seldom happens that the two clauses admit of the same regimen; and hence the case of the relative is often necessarily different from that of the antecedent, as the case of each must be accommodated to the clause in which it is found. Thus we cannot say, "*Deus qui* colimus bonus est;" but "*Deus quem* colimus bonus est;" because the regimen of the verb *colo* is always the accusative.

This shows the necessity of introducing a relative into those languages which give inflexions to their nouns. Were all the nouns of a language indeclinable, there would be little occasion for a relative; and accordingly in English it is often omitted. Examples are frequent in our best authors. Suffice it to quote the following:

"For I have *business would employ* an age."
Jane Shore.

"I had several *men died* in my ship of calentures."
Swift.

"They who affect to guess at the *object they* cannot see."
Bolingbroke.

We are not ignorant that our most eminent grammarians consider such expressions as chargeable with impropriety; and we are far from recommending them in any dignified or solemn composition. But in the instances adduced there is not the smallest degree of obscurity; at least there is none occasioned by the omission of the relative. The reason seems to be, that the mind can easily, by an effort of its own, make the antecedent unite, first with the one clause, and then with the other. Thus when it is said—"I have *business would* employ an age;" the mind can, without any difficulty, as the word business has no inflexions, consider it first as the objective case after *have*, and then as the nominative to *would employ*: but this cannot be so easily done in the ancient languages, where the termination of the noun is changed by the variation of its cases.

Both in the learned and in the living languages the relative has different forms, corresponding to the different genders of nouns; and by these it gives notice whether it is applied to persons, or to things without life. Thus in the English language we say, "The man or the woman *who* went to Rome;" "The *tree which* stands on yonder plain." It admits likewise, when applied to males or females, a variation of cases similar to that of the personal pronouns. Thus we say, "The man *whose* book is now before me; The man or woman *whom* I saw yesterday:" but the neuter admits of no such distinction *; as we say "The tree *which* I saw," as well as "The tree *which* stands on yonder plain." In modern languages the relative admits not of any distinction to denote number: for we say, "The *man* or the *men* who came yesterday; The *man* or the *men* of whom I speak."

* "*Whose* is by some authors made the possessive case of *which*, and applied to things as well as persons; I think improperly." *Lowth.*

In English, the word *that* is often used instead of the relative, as in the following examples: "He is the same man *that* I saw yesterday:—He was the ablest prince *that* ever filled a throne." With regard to the principle upon which this acceptation of the word *that* depends, we offer the following conjecture:

In English, from the cool and phlegmatic arrangement of the language, occasioned by the want of inflexions and conjugations, the place of every part of a sentence is almost uniformly determined, and very little variety is allowed in the collocation of the words. The adjective is almost always placed in opposition with its substantive, and the nominative with its verb. In consequence of this uniformity in the collocation of the words, the mind acquires a habit of connecting in idea any kind of word with the place in which it is used to stand; and is naturally led to consider every word that stands in such a place as belonging to such a class. Hence it is, we imagine, that the definitive *that* passes into the nature of the relative pronoun; as in those instances in which it occupies the place of the relative, it was natural to consider it as having the same import. Yet the word *that* has undoubtedly in itself no more the force of the relative pronoun than *the* or *this*, or any other definitive, whatever. In such expressions as the foregoing, it is not improbable that originally the clause of the definitive *that*, which we now call the relative clause, was thrown in as a kind of modifying circumstance in the following manner: "The book (I read that) is elegant;" where the speaker, finding the word book too general for his purpose, throws in a clause to qualify and restrict it, or to confine his affirmation to that particular book which he is then reading. We can easily suppose, that through time the definitive *that* in such an expression might be transposed or removed from its own place to that of the relative: so that the expression would run thus, "The book *that* I read is elegant;" which would be considered as precisely equivalent to "The book *which* I read is elegant."

We have said that the interrogative pronouns, as they are called, *who*, *which*, *what*, are intimately connected with relatives; we now affirm, that the two first of these words are nothing but relatives, and that the last contains in itself the united powers of a relative and definitive. With respect to cases, number, and gender, the words *who* and *which*, when employed as interrogatives, differ not from the same words when employed as relatives; and we hold it as a maxim, without which science could not be applied to the subject of language, that the same word has always the same radical import in whatever different situations it may be placed. To understand this, it is necessary to observe, that all men have a natural propensity to communicate their thoughts in the fewest words possible: hence it follows, that words are often omitted which are necessary to complete the construction of the sentence; and this no where happens more frequently than in the use of *who* and *which*. In sentences where these words are confessedly relatives, we often find them without an antecedent; as,

"*Who* steals my purse, steals trash."
Shakspeare.

"Which *who* would learn, as soon may tell the sands."
Dryden.

"Qui *Bavium non odit, amet tua carmina, Mævi.*
Virg

That is, "*He* who steals my purse, &c.;" "Which *he* would learn as soon, &c.;" and "Ille *qui Bavium non odit*," &c. Such abbreviations occasion no obscurity, because from previous circumstances the hearer knows the mind of the speaker and the persons to whom he refers. But it is not with respect to the relative and antecedent only that such abbreviations have place: in sentences of a different form, whole clauses are sometimes omitted, while the meaning of the speaker is made sufficiently plain. Thus when king Richard III. having lost his horse in battle, exclaims—"A horse! a horse! my kingdom for a horse!" there is no complete thought expressed; but the circumstances in which the king then was enabled those about to understand that he wanted a horse. Accordingly Catesby answers him—"Withdraw, my lord, I'll help you to a horse."

In like manner when a person asks a question, his expression is frequently incomplete; but the tone of his voice, or some other circumstance, enables us to ascertain his meaning, and to supply, if we please, the words that are omitted. Thus when it is said, *An fecisti!* nothing more is expressed than, *If you did it* (the Latin *an* being nothing else but the Greek *αν ει*); but some circumstance enables the person who hears it to know that the meaning is, "Say if you did it." Let us apply these observations to the words *who* and *which*. If these words be relatives, and if our analysis of the relative be just, it is obvious that no complete meaning can be contained in the clause, "*Who* is your principal friend?" for that clause contains nothing more than the circumstance of being your principal friend predicated of some unknown person; "of he is your principal friend." That this is indeed the case, every man may be convinced, by asking himself what he means by the interrogative *who* in such a sentence; for he will find it impossible to affix to it any meaning without supplying an antecedent clause, by which that which is called an interrogative will be immediately converted into the relative pronoun. The custom, however, of language, and the tone of voice with which the relative clause is uttered, intimates, without the help of the antecedent, the wish of the speaker to be informed by the person addressed of the name and designation of his principal friend; and we know that the sentence when completed is, "Tell me the name and designation of the person who is your principal friend." Again, when the prophet says, "Who is this that cometh from Edom, with dyed garments from Bozrah?" he utters but part of a sentence, which when completed will run thus: "Describe the person who cometh from Edom (this is that person), with dyed garments from Bozrah." He sees a person coming from Edom, of whose name and designation he is ignorant; he calls upon some one for information concerning these particulars; and that there may be no mistake, he describes the unknown person as having dyed garments from Bozrah; but lest even that description should not be sufficiently accurate, he throws in the definitive clause, *this is that person*, pointing at him, we may suppose, with his finger.—*Which*, used as an interrogative, indicates a wish of knowing a particular person or thing out of more than one mentioned; as, "Which of the two did it?" that is, "*Tell me the one* of the two which did it?" for in old English *which* as a relative is often used, where in modern English we should say *who;* and this mode of speech is still retained when the antecedent is omitted, and the relative clause employed to indicate such a wish as that before us. *What* includes in itself the signification of a definitive and a relative pronoun; as, "from *what* has gone before, *what* follows may easily be guessed;" where the word *what* is equivalent to *that which*. When therefore we say, "What rude fellow is that?" our meaning is, "Describe that person who is that rude fellow." Upon the whole, then, it is evident, that the words called interrogatives are merely relative pronouns; and that interrogative sentences are relative clauses uttered in such circumstances as to enable the hearer to supply the antecedents necessary to complete the meaning.

To conclude: We have seen that *substantives* are either primary or secondary; or, in other words, *nouns* or *pronouns*. *Nouns* denote substances, and those either natural, artificial, or abstract. They moreover denote things either general, or special, or particular; and a general or specific name is made to denote an individual by means of words called articles or definitives. *Pronouns* are the substitutes of *nouns*, and are either prepositive or subjunctive. The *prepositive* is distinguished into three orders, called the first, the second, and the third person. The *subjunctive*, otherwise called the *relative*, includes the powers of all those three, having superadded as of its own the peculiar force of a connective.

CHAPTER IV.

On Verbs.

Of all the constituent parts of speech none has given the grammarians greater trouble than the *verb*. Every schoolboy is told that the words, *is*, *loveth*, *walketh*, *standeth*, in English; and *est*, *amat*, *amatur*, *ambulat*, *stat*, in Latin, are *verbs*: he knows likewise that they are of different kinds; that some of them are said to be active, some passive, and some neuter. But it should seem, that the first object of our investigation ought to be the characteristic of the verb, or that which all these words have in common, and which constitutes them *verbs*, distinguishing them from every other species of words. Now what does distinguish these verbs from nouns? It is affirmation or assertion, according to a generally received notion: then as all languages have verbs, we are to expect that this property of affirming the essential of the verb, will not universally exist without the verb. But our first enquiry after verbs strikes us in an extraordinary manner. The Hebrew language wants that essential *is* or affirmative quality, when it joins the predicate to the subject with affirmation. Thus in English we say, "Happy *is* the man; the fear of God *is* the beginning of wisdom;" but this supposed essential verb is not to be found in Hebrew. "Happy the man. The fear of the Lord the beginning of wisdom." To prove the position that affirmation is the essential attribute of the verb, the following reasoning has been used:

Should we be required to exemplify our theory by language, and to produce instances of this simplified verb in practice, we might answer, that the not being able to produce such instances would be no good argument against the truth of our principles. It is the nature of language to express many circumstances by the same word, all of which however are not essential to distinguish the species to which that word belongs from the other species of words; and it is the nature of man to infer from discourse many things which are not actually expressed. Perhaps, however

something nearly approaching to an exemplification of our idea of a simple verb will be found in the following proposition: "The three angles of every plane triangle *are* equal to two right angles." What other office the verb *are* here performs than simply to join the subject and predicate, it is difficult to perceive. It does not give notice of time; or such notice, if given, is an imperfection; for the truth of the proposition is independent on time. Neither ought it to imply existence; for the proposition would be true, were there neither a triangle nor a right angle in nature.

Now the fact is, that the word *are* does mean existence, and existence only; and it is the word *equal*, which modifies the peculiar mode of the existence of the three angles.

Again in the English and the Hebrew languages, many words are at the same time acknowledged to be both nouns and verbs. The word *love* is a noun and a verb; but how by placing the pronoun *I* before *love*, does the latter acquire this affirmative quality? Love is sweet: sweetness is evidently affirmed of love: but when we say, "We love," how do we alter the nature of the noun but by joining the quality to ourselves? The word *love* is evidently the same in both cases, and the affirmation is not in the word itself, but understood. For this is equally good sense, "We affirm we love," which would make sad tautology if affirmation was also in love.

It has been said, and the assertion may very easily be maintained, that in all languages the radix of the verb is always a noun. It is so frequently apparent in English, that there is sufficient ground for enquiry. In Hebrew also the same analogy holds us out. In English the pronoun is separated from the verb. In Hebrew we see clearly that it is joined to it in general by abbreviation, either before or behind the verb. Hence the *o* and the *s* terminating *amo*, *amas*, are probably the abbreviations of *ego* and *su*; and though we cannot ascertain precisely the meaning of every termination in the verbs of various languag with increased knowledge it may perhaps be acquired.

Supposing then that the noun and the verb are in the radix exactly the same, let us examine the changes to which they are subject in consequence of their different appellation. The noun has cases, the verb has tenses. These tenses denote the different times in which a person or thing may be said to exist; also to every verb it is found that the pronoun is or may be applied; and hence perhaps we may be led to conclude, that the verb is a noun only which is capable of personal application at different times. *Desire* may be made a verb, because it can be applied to ourselves at this moment, or at a time past—*we desired*. *Globe* cannot become a verb, because though we may make a globe, be in a globe, &c. as yet it does not express a quality which can belong to persons, and it retains unchangeably its own qualities. Hence we shall not be at a loss to determine in our own language what are verbs and what are not: and the same may be applied to the infinitives of other languages, on which the learned have not determined, whether they are characteristics of the verbs, or no verbs at all.

The verb then requires time and person, the substantive does not. If the whole human race had never existed, and consequently time had not been the substantive, earth as well as the substance itself might have been the object of contemplation. Now time, if we speak of any event, is either past or future: and to express these tenses something must be done in the connection of the pronoun and the noun. To express past time, the Hebrew language places the pronoun after the noun: to express the future, it places the pronoun before the noun. The English language expresses but imperfectly the times, and is consequently obliged to call in auxiliary verbs; it adds a syllable to the noun to express the past time. The Latin and Greek languages go beyond the necessity of the case, and modify the periods of past and future time.

From not attending to the nature of time in itself, philosophical grammarians, as they are called, have endeavoured to ascertain the number of times or tenses which must be expressed by some means or other in every language. As a matter of speculation it may amuse them: they find no language agreeing with their theory, nor upon their principles can any number of tenses beyond the past and the future be allowed which may not be doubled or trebled at pleasure. The modifications of the past and future are infinite; and different methods are used in different languages to express some of these modifications. In these modifications consists much of what is called the idiom of the language; and which, in learning a language, ought particularly to be attended to. From want of this attention, an Englishman makes continual mistakes between the *etois* and the *fus* of the French: and the translators of the Bible, from a similar want of care, or ignorance of the structure of the English and Hebrew verbs, show in a thousand instances, that they were manifestly incompetent, in this respect, for the task which they had undertaken.

Our grammars having been constructed on those of the Greek and Latin languages, a certain variation in verbs is said to take place in our language, called moods; but though from *amo* we have *ama*, *amem*, *amarem*, &c. yet no such change is to be found in the corresponding verb *love*. We can express the same ideas in English as in Latin: but we do not do it by moods, nor is a number of moods essential to any language. In English and Hebrew we see nothing like the variety of the Greek and Latin. One mood, if it may be so called, is necessary: the indicative mood; if we allow more, we can see no reason for stopping. The Latins may express by *amem*, what the English express by *I may or can love*; and consequently the English has the advantage in precision: but *I may love or can love* is indicative of possibility applied to the quality in the person, and the *I may* or *I can* is to be found in the *em* of the Latins. Mood of verb has been defined to be a concise mode of expressing some of those combinations of thoughts "which occur most frequently and are most important and striking." The definition will certainly apply to the languages which have moods; but of them it may perhaps be justly said, that by an addition to the radix of the verb, which is an abbreviation of some definite verbs formerly in use, several languages express certain combinations of ideas, which in other languages, from this abbreviation not having taken place, are expressed by the use of other verbs applied to the principal verb.

The Greek and Latin languages have a certain variation in their verb, which goes by the name of voice; and hence it has been inferred that these voices are essential to language: but when we come to the true philosophy of language, that is,

the comparison of various languages now in or which formerly had been in existence, we shall scarcely find that any two languages agree together in the number of voices. Thus the Hebrew, in the opinion of some, has three; of others, has five voices: the Greek has three, the Latin two, the English certainly only one. These voices are in general distinguished from the nature, as it is called, of action or suffering; and all verbs are to be reduced to one of three classes—*acting, suffering*, or neither the one nor the other. Such a division may very well suit this or any other subject: the verb must be or not be any given thing, that may be proposed. There cannot be a doubt, that many verbs imply action, and the agent may become the patient, and he may suffer either from himself or another. Thus for the verb *beat*: A *beats* B; A is *beaten* by B; or A *beats* himself; instead of using the verb *is*, and the noun *himself*, these parts may be comprehended in the inflection of the verb, but this modification of the verb can apply only to a small class of words relating to actions. What are we to do with such verbs as *sleep* and similar ones? They must be called neuters; but then this class of neuters may be made very large, and verbs may be introduced which, if known to the Greeks and Latins, have not been formed in a separate class. Thus *to act* and *to cause to act*, may be distinguished in the verb as in the Hebrew language: and instead therefore of classing the verbs under three voices, active, passive, and neuter, we should perhaps look rather to the idiom of each language, and from that discover the changes made on the radix of the verb, to which if we please the name of *voice* may be applied. Thus in parts of action, where the agent may become the patient, there are evidently two states of the person. *I beat*, or *I am beaten*; which may be distinguished by the names of the active and the passive voice. *I beat myself*, the reflex voice in use among the Hebrews. *I cause to beat*, the causative voice in use in Hebrew: and there may be modifications without end in other languages, to which in a similar manner the name of *voice* may be applied. Since the English requires the use of another verb to express those states of the person which in other languages are implied by the form of the verb, this distinction of voices is superfluous, and should not be admitted into the grammar of the language.

Though the English language exceeds much in simplicity, with respect to voices, either the Latin, Greek, or Hebrew languages; yet there is an addition to the radix, which is analogous to a change in the verb of other languages, going by the name of participles. Of these participles we have two; in general called participles of the present, and participles of the past; *loving, loved; learning, learned*. They are called participles because they partake of the nature of the verb. *Loving, learning*, may be applied to persons, as may *loved, learned*, the former implying the actual existence of the quality in the person at the time spoken of; the latter that the quality had existed in the person. *He is learning English*, or *he has been learning English for some time past*. The present tense of the English language being rather an indefinite tense, this participle is also indefinite: *learning* in both of the above instances showing that the quality was existing in the man for an indefinite time. In the instances, "he is loved," or, "he has been loved," the participle *loved* shows that the quality had existed in the man at a former period; "he has been loved," namely, at a distant time; "he is loved," implies that the person at the present time is one who had love, and no intimation being given that the love of him ceased to exist, it naturally follows that we presume he will continue to be beloved. In all languages the participle has thus the circumstance of time attending the quality expressed, which may belong to a person; and hence it differs from another class of words generally called adjectives.

CHAPTER V.

On Adjectives.

Nouns we have said are words by which objects are denominated, and which distinguish them from one another without marking their quality; and hence as these objects have a vast variety of qualities by which they may be compared together, there must be words to express these qualities only, and these words are called adjectives. Thus of apples we may say, "This is a sweet apple, that a sour apple." The words *sweet* and *sour* are adjectives. Since the adjective is the word expressing the quality of some object, it can have no meaning by itself, and requires the presence or the implied presence of the substantive; and hence in some languages a change takes place in the adjective according to the nature of the substantive, which is very perplexing oftentimes to a learner. In English, agreeably to the simplicity of its noun, there is no such change: in most other languages the adjective varies its termination according to the gender or the number of the substantive to which it is applied.

Qualities admit of intensity or remission. One apple may be sour, but another may have more of that quality; and hence in some languages a distinction is made of comparison, and that by degrees, which sometimes are called the comparative and the superlative degrees. These degrees are expressed by an addition to the adjective, in English as *sour, sourer, sourest*, or by applying the words *more* and *most*, as *more delightful, most delightful*; and from those different ways of expressing the same thing in the same language, it is evident that the confining of adjectives to two degrees is superfluous in the philosophy of language, and that we may expect to find some language, in which this classification does not take place. This is the case in the Hebrew language, to which of all others the English approaches nearest in simplicity. If we allowed of these degrees in general, there would be no end to the classes: if one is allowed for adjectives which denote a quality greater, there should be another for a quality less; *more delightful, less delightful*, would be two classes of the comparative, and the superlative is evidently a comparative of greater intensity.

Since adjectives express qualities, and therefore cannot be used without the substantives expressed or implied, we now see why particles should frequently be taken for, or seem to pass into the class of, adjectives. "A learned man is never esteemed by a man whose claim to distinction is founded on his wealth or his rank." In this sentence, *learned* may be considered as an adjective, because from long use the quality only is expressed without reference to time. From having learned, the man is supposed to possess a quality which distinguishes him from others, and this quality is seen when placed in opposition to others who have not had the same advantages. They are called rude, barbarous. Thus we say, "A rude man and a learned man are opposites;" where *rude* is acknowledged at once to be an adjective, and

learned isconsidered of the same class, because it is significant only of quality without reference to time.

The name of adverbs is given to a class of words in most languages, such as to the words *exceedingly*, *while*, *olim*, *ἔτι*, and the like; and as adjectives are called the attributes of substances, these adverbs are called attributives of the second order, because they modify the attributes. Unfortunately in all languages a number of words is placed in this class, which strike the observer at first sight to be compound words. Thus, *notwithstanding* in the English, *cependant* in the French, are evidently compounds. *While* is a substantive, meaning time, as is *ἔτι* of the Greeks. *Wisely* is a compound of two adjectives, and we may say, "He speaks wisely," or "He speaks like a wise man," indifferently; the use of the adverb, as it is called, giving conciseness only to the expression. This class of words was formed from the ignorance of the parts in every compound; thus if, instead of *like a wise man*, we translate the phrase into Latin, and use the word *sapienter*, this *sapienter* is immediately classed as an adverb or something distinct from the adjective or verb; yet the *er* probably has the same force with the *ly* in our own tongue.

We may modify the quality expressed by a verb or a noun various ways. A high mountain may be called, "An exceedingly high mountain;" where *exceedingly* is applied to *high*, *high like exceeding*, namely, most mountains we know. "He suffers patiently;" namely, "Like a patient man." "While the country was alarmed by spies and pretended plots, the alarmists were really attacking the lives and property of their fellow-countrymen." *While* is called an adverb, but it is a substantive; and we frequently say, "All the while, i. e. all the time;" *while* therefore means during the time; *really* is like *real men*, and is in opposition to *pretended*. In all languages therefore where this class is admitted, the student should endeavour to learn the force of the word not by fanciful modifications of verbs and adjectives in a variety of senses, but by learning the real meaning of the word. For our language we may shortly expect to see great improvement made in this branch of our science, as it will afford great scope for the researches of our best, and we might almost say, our only grammarian.

CHAPTER VI.

On Conjunctions, Prepositions, and Interjections.

Conjunctions and prepositions come next in the general division of words. Conjunctions are words which are to "connect either two or more words in a sentence, or to make of two simple sentences one compound sentence." This is the general account: but unfortunately, we stumble at the next step without having enquired after any of these words, for these conjunctions are immediately after divided into two classes, the one called connective, and the other disjunctive; that is, one class of these connecting words, instead of connecting, disjoin; and so many other equally fanciful distinctions take place, that instead of following such absurdities, let us hearken to plain sober sense, whose dictates are confirmed by matter of fact and experiment. There are certain words in all languages, which by frequent repetition have lost their original form, and their meaning is not obvious. Such are the words *if*, *and*, *because*, *or*. From their meaning not being known, fanciful writers have supposed them to have no meaning at all, and that they were mere sounds to connect or disjoin, were continuative, subcontinuative, collective, &c. &c. But Mr. H. Tooke has shown us, that many of these words are the imperatives of old Saxon verbs; and the Hebrew language is a confirmation of his theory. We shall subjoin his table, which will save the trouble of many tedious metaphysical enquiries.

	Are the Imperatives	Of their Respective Verbs	
If	Gif	Gifan	*To give.*
An	An	Anan	*To grant.*
Unless	Onles	Onlesan	*To dismiss.*
Eke	Eac	Eacan	*To add.*
Yet	Get	Getan	*To get.*
Still	Stell	Stellan	*To put.*
Else	Ales	Alesan	*To diminish.*
Though or Tho'	Thafig or Thaf	Thafigan or Thafian	*To allow.*
But	Bot	Botan	*To boot, to superadd.*
t	Be-utan	Beon-utan	*To be out.*
Without	Wyrth-utan	Wyrthan-utan	*To be out.*
And	An ad	Anan-ad	*Dare congeriem.*

Lest is the participle Lesed of Lesan, *to dismiss.*

Since { Siththan, Syne, Seand-es, Siththe or Sin-es } is the participle of Seon, *to see.*

That is the article or pronoun *that.*
As is es, a German article, meaning *it*, *that*, or *which*. And
So is sa or so, a Gothic article of the same import with *as*.

From considering the above table, and referring to a similar derivation in other languages, we have reason to believe that there is no such separate class as conjunctions or words without meaning, to connect and disjoin, but that the connection or disjunction is to be found in the meaning of the word.

If we are right in our opinion with respect to conjunctions, we shall naturally be little inclined to admit prepositions as another class of words, without meaning, to unite two "words of meaning together, which without this assistance could not coalesce." We shall look to derivation for the meaning of these words; and if we have any

grounds for giving them a meaning, we shall class them accordingly. Let us try then with the supposed prepositions, *with, without, chez*, χωρις, *sonder*.

With means, in all cases where it is employed, addition; *without*, the contrary. "The king of England, with the lords and commons, can make a law: without the lords and commons, cannot make a law." Join the lords and commons to the king, and his act is good: take them away, and in law-making he becomes a cypher. There is an Anglo-Saxon verb, *withan*, whose imperative is *with*; this imperative we say remains in use in what is called the preposition *with*; the other parts of the verb are obsolete. *Without* comes from the Saxon *wyrthan-utan, be out*. Thus in French *avec*, corresponding to our *with*, is from the imperative of *avoir* and the adjective *ce, have that*. *Chez* is called a preposition in French; but it is in reality a corruption of *casa*, "a house;" *chez moi*, "at my house." χωρις may very reasonably be referred to χωριζω, when *sonder* of the Germans, of similar import, seems to have the same relationship to *sondern*, the verb.

Thorough, thourough, thorow, through, or *thro'*, is no other, says Horne Tooke, than the Gothic substantive *dauro*, or the Teutonic substantive *thuruh*, and, like them, means door, gate, passage. So that the sentence cited by him, resolved upon his principles, stands thus: "The splendid sun—*join* his beams—genially warmeth—*passage* the air, (or, the air being the passage or medium)—the fertile earth." And in the same manner may we translate the preposition *through* in every instance where *through* is used in English, or its equivalent preposition in any language; as from the Latin and Italian word *porta* (in Spanish *puerta* and French *porte*), have come the Latin and Italian preposition *per*, the French *par*, and the Spanish *por*.

Up, upon, over, bove, above, have all, says Horne Tooke, one common origin and signification. In the Anglo Saxon, *ufa, ufera, ufemæst*, are the adjectives *altus, altior, altissimus*. *Ufa* or *ufan*, up; comparative *ufera, ofere* or *ofer*, over or upper; superlative *ufemæst*, upmost or uppermost. *Beufan, bufan, on-bufan*, bove, above. If this be a just account of the origin of these words, the sentences in his text, where *upon, over*, and *above*, occur, will run thus: "The statue stood *on high* a pedestal;" "the river ran *higher* a sand;" "the sun is risen *on high* the hills." And here we may observe, that the mere relation between *standing, running*, &c. and *place*, is rather inferred from the verb itself, than expressed by a separated word; and the reason is obvious. For if a statue stand, every one knows that it must stand on something as well as at some time. There is therefore no necessity, whatever elegance there may be in it, for employing any word to denote that relation, which is commonly believed to be signified by *on*; but it is necessary to insert, between the verb and pedestal, a word significant of place, that pedestal may not be mistaken, by an ignorant person, for a portion of time, or any thing else connected with the standing of the statue.

Hence we may see the absurdity of a sentence given sometimes by our judges. The man shall stand in and upon the pillory: by which they do not mean two distinct placings of the convict, though the words themselves do; but this is one only out of the thousand instances of the absurdity in the courts of law, of giving sanction to an absurd precedent, instead of correcting every absurdity the moment it is detected.

Having thus restored meaning to our prepositions and conjunctions, we come to the last part of the general division of words in modern grammars, to the class of interjections, on which we shall make use of good authority. "The neighing of a horse, the lowing of a cow, the barking of a dog, the purring of a cat, sneezing, coughing, groaning, shrieking, and every other involuntary convulsion and oral sound, have almost as good a title to be called parts of speech as interjections. In the intercourse of language, interjections are employed only when the suddenness or vehemence of some affection or passion returns men to their natural state, and makes them for a moment forget the use of speech: or when, for some circumstance, the shortness of time will not permit them to exercise it." It is pleasant to observe, what curious words, nay sentences, are placed by writers in the class of interjections. Thus Dr. Beattie ranks, *strange, prodigious, amazing, dear me*, in this class; and we may go on with this author in making a pretty list. In general the interjections are inarticulate sounds, which have nothing to do with speech, and may be significant of pleasure or pain, surprise, &c. A laugh, or a shriek, or a sneeze, will intervene in conversation: but they cannot, either of them, come into any division of words.

Upon the whole, then, we may observe of grammar, that as a science it is at present very defective: instead of making an intimate acquaintance with a variety of languages the basis of a general theory, most writers have employed themselves in what are called metaphysical disquisitions, and the result of their speculations has been frequently contradicted by a plain reference to matter of fact in the languages with which they were unacquainted. It seems natural to suppose, that language in its origin must have been very imperfect: that signs were frequently used to give signification to men's words, just as difference of the tone of the voice makes now a difference in the meaning of the same sentence. Objects in nature were first expressed by certain sounds; qualities were observed in them which were imitated by sounds, as the hissing of the snake: words were connected together into sentences, and after a considerable length of time, words which occurred very frequently suffered abbreviation. Hence imperfect ideas were annexed to many words; the art of speech was abused: it frequently did not convey the ideas of the speaker, and was intended to deceive the hearer.

As most knowledge is communicated by language, it is evidently incumbent that the principles of it should be well understood: and hence the first requisite is to instruct the learner in the meaning of every word, and to shew how, by various processes, it came to lose some part of its original meaning, to have more or fewer ideas annexed to it. This is not a trifling knowledge in itself; when we consider that the perfect knowledge of any science will imply a knowledge of all the objects with which that language is conversant; and an accuracy and precision in the thoughts of every educated man will be the consequence of the first principles of his education. But there are many obstacles to the promotion of this science, among which we do not know a greater than the practice of the law at present in England. In this profession there is an affectation of accuracy in the use of words; but, from the want of

studying the principles of language, by a multiplicity of words, oftentimes of a contradictory nature, the judges and barristers envelope a plain matter in the utmost obscurity. This obscurity is increased by the retaining of ancient laws, which ought to be modernized: by paying the profession according to the number of words employed, instead of the judgment and mode of sagacity exercised. We might add, that the drawing up acts of parliament must necessarily injure our language: they should not be intrusted to a technical lawyer, but to a master of language. Moliere's housekeeper would be a better judge of the propriety of a sentence than some lord chief justices.

To understand the theory of language, then, we must do as in other sciences, make experiment the basis of our proceedings. We must not make distinctions in our language, because such are necessary in another. We must attend to the structure of each particular language, and from combining together the various facts in which they all agree, we may at last form our notions into principles, and lay the foundation of universal grammar.

Grammar school. *s.* A school in which the learned languages are grammatically taught.

GRAMMARIAN. *s.* (*grammairian*, Fr. from *grammar*.) One who teaches grammar; a philologer (*Holder*).

GRAMMATICAL. *a.* (*grammatical*, Fr.) 1. Belonging to grammar (*Sidney*). 2. Taught by grammar (*Dryden*).

GRAMMATICALLY. *ad.* According to the rules or science of grammar (*Watts*).

GRAMMATICASTER. *s.* (Latin.) A mean verbal pedant; a low grammarian (*Rymer*).

GRAMME, in French weights. The unit weight, called a gramme, is the weight of the cube of the hundredth part of the metre of distilled water, taken at its maximum density. It answers to 15.444 grains. The kilogramme, or the weight of a thousand grammes, is equal to 32½ Troy ounces.

GRAMMITIS. In botany, a genus of the class cryptogamia, order filices. Fructification in straight scattered lines: involucreless. Six species; all exotics.

GRAMMONT, a town of Austrian Flanders, seated on the river Dender. Lat. 50. 47 N. Lon. 3. 59 E.

Grammont, a town of France, in the department of Upper Vienne. Lat. 46. 1 N. Lon. 1. 30 E.

GRAMPIAN HILLS, mountains of Scotland, which extend through the counties of Perth, Angus, Mearns, and Aberdeen. They take their name from a single hill, the Mons Grampius, of Tacitus, where Galgacus waited the approach of Agricola, and where the battle was fought so fatal to the brave Caledonians. Antiquarians have not agreed upon the particular spot.

GRAMPOUND, a small borough in Cornwall, with a market on Saturdays. Here is a considerable manufactory of gloves. Lat. 50. 22 N. Lon. 4. 49 W.

GRAMPLE, in ichthyology. See Cancer.

GRAMPUS, in ichthyology. See Cyprinus.

GRAN CANTORE, in music, a fine singer.

Gran gusto, a musical expression, denoting a rich and full composition.

GRANA CNIDII. See Coccognidia.

Grana paradisi. Cardamomum majus, meleguetta maniguetta, cardamomum piperatium. The grains of paradise are the seeds of the amomum grana paradisi of Linnéus. (See Amomum.) They are angular reddish-brown seeds, smaller than pepper, and resembling very much the seeds of the cardamomum minus. They are extremely hot, and similar in virtue to pepper. See Piper nigrum.

Grana tinctoria. See Kermes.

Grana tiglia. See Tiglia grana.

GRANADA, a province of Spain, bounded on the N. and W. by Andalusia, on the E. by Murcia, and on the S. by the Mediterranean Sea. It is about 175 miles in length, and 75 in breadth; is a mountainous country, and yet the soil is good; but it has not been well cultivated since the Moors were expelled from it in 1492. However, it produces corn, wine, oil, sugar, flax, hemp, excellent fruits, honey, wax, grapes, and mulberry-trees, which feed a great number of silk-worms. The forests produce gall-nuts, palm-trees, and oaks. Granada is the capital.

Granada, a large, handsome, and delightful city of Spain, capital of the kingdom of Granada, with an archbishop's see, and a university. It is built on four hills, and divided into four parts, in one of which is the large church, containing the tombs of Ferdinand and Isabella, who took this place from the Moors in 1492. In another is a palace of the kings of Spain, and an ancient palace of the Moorish kings, with so many rooms, that it is like a labyrinth; in the third the university stands; the fourth has nothing considerable: but all the public buildings are very magnificent. It is seated not far from the river Oro, near its confluence with the Xenil, 125 miles S.W. of Murcia, and 225 S. of Madrid. Lat. 37. 8 N. Lon. 3. 30 W.

Granada, an island in the W. Indies, the principal of the Granadillas, or Granadines, situated in 61. 40 W. lon. and between 11. 55 and 12. 23 N. lat. It is the last of the Windward Caribbees, and is 30 leagues to the N.W. of Tobago. The chief port, called Lewis, is on the W. side, and is very spacious. This island is finely wooded; and the soil is suited to produce sugar, tobacco, and indigo. It was taken from the French in 1762, confirmed to the English in 1763, taken by the French in 1779, and restored to the English in 1783.

Granada, a town of N. America, in the province of Nicaragua, seated on lake Nicaragua, 70 miles from the South Sea. The inhabitants carry on a great trade by means of the lake which communicates with the Atlantic Ocean. Lat. 12. 5 N. Lon. 87. W.

Granada (New), a province of S. Ame-

rica, in Terra Firma, about 75 miles in length, and as much in breadth. It is bounded on the N. by Carthagena and St. Martha, on the E. by Venezuela, on the S. by Popayan, and on the W. by Darien. It contains mines of gold, copper, and iron; horses, mules, good pastures, corn, and fruits. Santa-Fe-de-Bagota is the capital.

GRANADILLOES, the name of some islands of the Caribbees, in America, having St. Vincent to the north, and Granada to the south. They are so inconsiderable that they are quite neglected; but were ceded to England by the treaty of peace in 1763.

GRANADIER, a soldier armed with a firelock, a bayonet, and, occasionally, a pouch full of hand-granadoes. They wear high caps, are generally the tallest and briskest fellows, and are always the first upon all attacks. Every battalion of foot has generally a company of granadiers belonging to it; or else four or five granadiers belong to each company of the battalion, which, on occasion, are drawn out, and form a company of themselves. These always take the right of the battalion.

GRANADO, a hollow ball or shell, of iron or other metal, about two inches and a half in diameter; which being filled with fine powder, is set on fire by means of a small fusee fastened to the touch-hole, made of the same composition as that of a bomb: as soon as the fire enters the shell, it bursts into many pieces, much to the damage of all that stand near.

GRANARY, a building to lay or store corn in, especially that designed to be kept a considerable time. Sir Henry Wotton advises to make it look to the north, because that aspect is the coolest and most temperate. Mr. Worlidge observes, that the best granaries are built of brick, with quarters of timber wrought in the inside, to which the boards may be nailed, with which the inside of the granary must be lined so close to the bricks, that there may not be any room left for vermin to shelter themselves. There may be many stories one above another, which should be near the one to the other; because the shallower the corn lies, the better it is, and more easily turned. There must never be a cellar, or any other damp place, under a granary, nor should it ever be built over stables; for in either of these cases the corn will certainly suffer by the vapours, and be made damp in one, and ill-tasted in the other. Mem. Acad. Par. 1708.

Two great cautions to be observed in the erecting of granaries are, to make them sufficiently strong, and to expose them to the most drying winds. The ordering of the corn in many parts of England, particularly in Kent, is thus: To separate it from dust and other impurities after it is thrashed, they toss it with shovels from one end to the other of a long and large room; the lighter substances fall down in the middle of the room, and the corn only is carried from side to side, or end to end of it. After this they screen the corn, and then bringing it into the granaries, it is spread about half a foot thick, and turned from time to time about twice in a week; once a week they also repeat the screening it. This sort of management they continue about two months, and after that they lay it a foot thick for two months more; and in this time they turn it once a week, or twice if the season be damp, and now and then screen it again. After about five or six months the raise it to two feet thickness in the heaps, and then they turn it once or twice in a month, and screen it now and then. After a year, they lay it two and a half or three feet deep, and turn it once in three weeks or a month, and screen it proportionably. When it has lain two years or more, they turn it once in two months, and screen it once a quarter; and how long soever it is kept, the oftener the turning and screening is repeated, the better the grain will be found to keep.—It is proper to leave an area of a yard wide on every side of the heap of corn, and other empty spaces, into which they turn and toss the corn as often as they find occasion. In Kent they make two square holes at each end of the floor, and one round in the middle, by means of which they throw the corn out of the upper into the lower rooms, and so up again, to turn and air it the better. Their screens are made with two partitions, to separate the dust from the corn, which falls into a bag, and when sufficiently full this is thrown away, the pure and good corn remaining behind. Corn has by these means been kept in our granaries 30 years; and it is observed, that the longer it is kept the more flour it yields in proportion to the corn, and the purer and whiter the bread is, the superfluous humidity only evaporating in the keeping. At Zurich in Swisserland, they keep corn 80 years, or longer, by the same sort of methods.

M. Du Hamel, and Dr. Hales, have recommended various contrivances for ventilating, or introducing fresh air through corn deposited in granaries, with a view to preserve it sweet and dry, as well as to secure it from weevils or other insects. This object is to be effected by constructing granaries with lattice-work, and hair-cloth at the bottom. The ventilators for supplying fresh air may be affixed to the wall, either within or on the outside of the granary, beneath the floor, or in the ceiling; but, in the former case, it will be necessary to place the handle of the lever externally, as otherwise the person working the machinery would be exposed to suffocation, when the corn is fumigated with sulphur for the expulsion of weevils.

To preserve corn in barns or granaries, Dr. Darwin observes, it is requisite first to make them dry, and, secondly, to keep them in that state; because no seeds will vegetate without moisture. In order to dry seeds, the heaps should be frequently turned over in warm dry weather: hence, in this climate, the doors and windows of granaries should open towards the south, for the reception of the warmth of the sun, with air-holes round the building, for sufficient ventilation; and which apertures ought to be sheltered from rain or snow, by

boards placed for that purpose on the outside. Heaps of corn should be surrounded with planks, in order to prevent them from touching either brick or stone walls; because, when north-east winds are succeeded by moist and warm south-west winds, such walls frequently precipitate the moisture from the atmosphere, and communicate it to those bodies which are in contact with them. According to Mr. Tull, the safest method of preserving a large quantity of wheat is, to dry it gradually in a malt-kiln on a hair-cloth, with no other fuel than clean straw, and with a heat scarcely exceeding that produced by the rays of the sun. In this temperature, the grain is to remain from four to twelve hours, in proportion to its previous dampness. The vegetative principle of the corn is not destroyed by this process; as instances have occurred of its growing when sown, after it had been thus kept for seven years.

GRANATE. See GRANITE.

GRANATUM. (*granatum*, from *granum*, a grain, because it is full of seed.) The pomegranate. The fruit of the punica granatum of Linnéus. Punica foliis lanceolatis, caule arboreo. The rind of the fruit, and the flowers (called balaustine flowers), are the parts directed for medicinal use. In their smell there is nothing remarkable, but to the taste they are very astringent, and have successfully been employed as such in diseases both internal and external.

GRAND. *a.* (*grand*, French; *grandis*, Latin.) 1. Great; illustrious; high in power (*Raleigh*). 2. Great; splendid; magnificent (*Young*). 3. Principal; chief (*Milton*). 4. Eminent; superiour (*Milton*). 5. Noble; sublime; lofty; conceived or expressed with great dignity. 6. It is used to signify ascent or descent of consanguinity.

GRAND DAYS, are those days in the several terms which are solemnly kept in the inns of the court of chancery, viz. Candlemas-day, Ascension-day, St. John the Baptist, and All Saints'-day.

GRAND JURY, is the jury which find bills of indictment before justices of peace and gaol-delivery, or of over and terminer, &c. against any offenders that may be tried for the fact. See JURY.

GRA'NDAM. *s.* (*grand* and *dam* or *dame.*) 1. Grandmother; my father's or mother's mother. 2. An old withered decrepid woman.

GRANDCHILD. *s.* The son or daughter of a person's son or daughter.

GRANDAUGHTER. *s.* The daughter of a son or daughter.

GRANDE'E. *s.* (*grand*, French.) A man of great rank, power, or dignity (*Wotton*).

GRANDE'VITY. *s.* (from *grandævus*, Latin.) Great age; length of life.

GRANDE'VOUS. *a.* (*grandævus*, Lat.) Long lived; of great age.

GRA'NDEUR. *s.* (French.) 1. State; splendour of appearance; magnificence (*Sou.*). 2. Elevation of sentiment, language, or mien.

GRA'NDFATHER. *s.* (*grand* and *father.*) The father of my father or mother (*Bacon*).

GRANDI'FICK. *a.* (*grandis* and *facio*, Lat.) Making great.

GRA'NDINOUS. *a.* (*grando*, Latin.) Full of hail; consisting of hail.

GRA'NDITY. *s.* (from *grandis*, Latin.) Greatness; grandeur; magnificence (*Camden.*)

GRA'NDMOTHER. *s.* (*grand* and *mother.*) The father's or mother's mother (*Timothy*).

GRA'NDSIRE. *s.* (*grand* and *sire.*) 1. Grandfather (*Prior*). 2. Any ancestor, poetically (*Pope*).

GRA'NDSON. *s.* (*grand* and *son.*) The son of a son or daughter (*Swift*).

GRANGE. *s.* (*grange*, French.) A farm: generally a farm with a house at a distance from neighbours (*Ben Jonson*).

GRANGERIA. In botany, a genus of the class dodecandria, order monogynia. Calyx five-cleft; petals five; stamens fifteen; drupe somewhat three-sided; nut three-sided, bony, one-seeded. One species: a tree of the isle Bourbon, with alternate, ovate, entire leaves, and racemed flowers.

GRANI, in our old writers, mustachoes, or whiskers of a beard. The word is formed from the British *greann*, a beard.

GRANIC, a small river of Natolia, which has its source in Mount Ida, near the ruins of ancient Troy, and falls into the sea of Marmora, to the E. of Lampsaco.

GRANITES. In mineralogy, a genus of the class earths, order aggregate. Consisting of parts mostly in the form of crystals, cohering without any intermediate cement, and mixed without any determinate order; generally of a granular texture, hard and durable; admitting a fine polish; constituting the principal material and nucleus of primitive lofty mountains. Sixty-two species; all, excepting one or two, confined like gneiss to Europe, and found chiefly in Germany, and the neighbouring territories; on the Alps, and in the vicinity of Vesuvius. The following are the chief.

1. G. simplex. Consisting of feldspar and quartz. Found in the Subaudia, Swiss, Siberian and Scotch mountains, and detached near Geneva. The component parts vary as to their predomination, but the particles of feldspar are sometimes so combined as to resemble Syriac letters.

2. G. genuinus. Real granite. Consisting of feldspar, quartz, and mica. The most common kind of granite: found in primitive and sometimes in secondary mountains in most parts of the globe in innumerable varieties of hardness, proportion, distribution, and colour of parts. Sometimes found mixt with other minerals, as schorl, horn-blend, crystals of garnet, steatite, and alumine. It melts in a high degree of heat; leaving, however, the quartz unchanged. The feldspar is often flesh-colour; the quartz generally white, rarely greenish. It takes a very high polish, and on this account has for many ages been used in

the architecture of columns, palaces, and churches.

3. G. syenites. Syenite. Consisting of feldspar, quartz, and horn-blend. Found in Egypt, Greece, Norway, and Saxony, &c. sometimes in large masses, sometimes in smaller granulations: the component parts vary much; but the horn-blend and feldspar generally predominate, and the quartz is in very small proportion: the colour of the feldspar and quartz is generally white, and the horn-blend black, or black-green.

GRANI'VOROUS. *a.* (*granum* and *voro*, Latin.) Eating grain; living upon grain (*Arbuthnot*).

GRA'NNAM. *s.* (from *grandam.*) Grandmother (*Gay*).

GRANSON, a town of Swisserland, in the Pays de Vaud, capital of a bailiwic of the same name, with a castle. Lat. 46. 50 N. Lon. 6. 30 E.

To GRANT. *v. a.* (from *gratia*, or *gratificor*, Latin.) 1. To admit that which is not yet proved; to allow; to yield; to concede (*Addison*). 2. To bestow something which cannot be claimed of right (*Pope*).

Grant. *s.* (from the verb.) 1. The act of granting or bestowing. 2. The thing granted; a gift; a boon (*Dryden*). 3. (In law.) A gift in writing of such a thing as cannot aptly be passed or conveyed by word only (*Cowell*). 4. Admission of something in dispute (*Dryd.*).

GRA'NTABLE. *a.* (from *grant.*) That may be granted (*Ayliffe*).

GRANTE'E. *s.* (from *grant.*) He to whom any grant is made (*Swift*).

GRANTHAM, a borough in Lincolnshire, with a market on Saturdays. It sends two members to parliament, and has a church famous for its high spire. It contains 1457 houses, and 7014 inhabitants. Lat. 52. 59 N. Lon. 0. 36 W.

GRA'NTOR. *s.* (from *grant.*) He by whom a grant is made.

GRANVILLE, a seaport of France, in the department of the Channel, and late province of Normandy. Lat. 48. 50 N. Lon. 1. 32 W.

Granville (George), lord Lansdowne, was descended from a very ancient family; derived from Rollo the first duke of Normandy. At eleven years of age he was sent to Trinity College in Cambridge, where he remained five years: but at the age of thirteen was admitted to the degree of master of arts; having, before he was twelve, spoken a copy of verses of his own composition to the duchess of York at his college, when she paid a visit to the university of Cambridge. In 1696 his comedy called The She-gallants was acted at the theatre-royal in Lincoln's-inn-fields, as his tragedy called Heroic Love was in the year 1698. In 1702 he translated into English the second Olynthian of Demosthenes. He was member for the county of Cornwall in the parliament which met in 1710; was afterwards secretary at war, comptroller of the household, then treasurer, and sworn one of the privy-council. The year following, he was created baron Lansdowne. On the accession of king George I. in 1714, he was removed from his treasurer's place; and the next year entered his protest against the bills for attainting lord Bolingbroke and the duke of Ormond. He entered deeply into the scheme for raising an insurrection in the west of England; and being seized as a suspected person, was committed to the Tower, where he continued two years. In 1719 he made a speech in the house of lords, against the bill to prevent occasional conformity. In 1722 he withdrew to France, and continued abroad almost ten years. At his return in 1732, he published a fine edition of his works in 2 vols. quarto. He died in 1735, leaving no male issue.

GRANULARIA. In botany, a genus of the class cryptogamia, order fungi. Fungus roundish, filled with granulations immersed in a mucilage.

GRA'NULARY. *a.* (from *granule.*) Small and compact; resembling a small grain or seed (*Broome*).

To GRA'NULATE. *v. a.* (*granuler*, Fr.). To be formed into small grains (*Sprat*).

To Gra'nulate. *v. a.* 1. To break into small masses or granules. 2. To raise into small asperities (*Ray*).

Granulate root, in botany, beaded, With.—Particulis carnosis adspersa. Consisting of several little tubers or fleshy knobs, resembling grains of corn: as in Saxifraga granulata.

GRANULATION, in chemistry, the process by which a metal is reduced into grains, which is effected by melting the metal, and then pouring it in a very slender stream into cold water. As soon as the metal comes in contact with water it divides into drops, which have a tendency to a spherical shape, and are more or less perfect, according to the thinness of the stream; the height from which it falls, and the temperature of the metal. Some of the more fusible metals may be reduced to much finer grains, by pouring it in its melted state into a wooden box, rubbed over with chalk, and shaking it violently before it has time to become solid.

Granulation, in surgery, incarnation, the production of new granules of flesh in a wound.

Granulation, denotes also the mechanical process by which some hard bodies are broken into small masses or grains.

GRA'NULE. *s.* (from *granum*, Lat.) Full of little grains.

GRA'NULOUS. *a.* (from *granule.*) Full of little grains.

GRANUM MOSCHI. See Abelmoschus.

GRAUWACKE, grey wack or wachen, in mineralogy, an aggregate argillaceous earth or rock for which we have no English name, and which comprises two varieties, one simpler, and the other more compound.

The more compound constitutes the com-

mon grauwacke, and is composed of grains of quartz, siliceous schistus, and pure slate, ardesia or argillate, agglutinated by an argillaceous cement. The grains vary from the size of a pin's head to that of a hazle nut.

The simpler or slaty grauwacke is mere schistose rock with so small an intermixture of other materials, that, at first sight, it may easily be confounded with pure argillate or ardesia: but which, on nearer inspection, will be found to differ in the following particulars: its colour is of a dirty grey; it is entirely destitute of lustre; it contains spangles of mica, which true slate never does in its geological situation, and it is never divided by beds of chlorite slate or wetstone slate.

Both varieties are traversed by veins of quartz in various directions, and contain occasionally shells of vegetable remains; but neither of them ever contain beds of other kinds of rock. They are never distinctly stratified, though their inclination is never parallel with that of the rock on which they rest. Both varieties exhibit, at times, beds of glance-coal, and are rich in metallic ores: the mines of lead and silver in the Hartz, and some of the gold mines in Transylvania, lie in this rock. See Basaltes wacca.

GRAPE. See Vitis.

Grape (Hyacinth). See Hyacinthus.

Grape-shot, in artillery, is a combination of small shot, put into a thick canvass bag, and corded strongly together, so as to form a kind of cylinder, whose diameter is equal to that of the ball adapted to the cannon. The number of shot in a grape varies according to the service, or size of the guns: in sea-service nine is always the number; but by land it is increased to any number or size, from an ounce and a quarter in weight to three or four pounds. In the sea-service the bottoms and pins are made of iron, whereas those used by land are of wood.

GRAPESTONE. *s.* The stone or seed contained in the grape.

GRAPHIC (Gold). See Tellurium.

GRA'PHICAL. *a.* (γράφω.) Well delineated (*Bacon*).

GRA'PHICALLY. *ad.* In a picturesque manner; with good description or delineation (*Brown*).

GRAPHITES. In mineralogy, a genus of the class inflammables: consisting principally of carbon with a little iron, and generally a little silex or alumine; when pure it burns with a reddish flame, emitting beautiful sparks, and a smell of sulphur, leaving but a little residuum; black, opake, very soft, feels somewhat greasy, and stains the fingers; is brittle, and breaks into indeterminate fragments. Three species.

1. G. plumbago. Plumbago. Black-lead. Of a metallustic and slaty structure. Found in different parts of Great Britain, particularly near Dumfries in Scotland, at Borrowdale and Keswick in Cumberland: in Greenland and various other parts of the continent. Colour blackish or iron grey, blueish-grey when cut with a slight metallic lustre, yields to the impression of the nail, and makes a black mark on paper; texture compact, with a fine grain, and a little flexible. It is chiefly used for making black-lead pencils; for blackening stoves; and, when mixed with a proper proportion of silex, for crucibles.

2. G. cartes. Of a conchoidal structure, breaking into indeterminate fragments. Found near Schomniz in Hungary, imbedded in thin strata or veins of black indurated alumine; near Zokarweniza running through a matrix of opal like a vein; in France and Norway.

3. G. fuligo. Deep black internally, making a deep black mark. Found near Duttweiler in Nassovia, alternating in thin strata with coals. It is probable that these three species are only varieties of one common species.

GRAPHOMETER, a mathematical instrument, otherwise called a semi-circle, the use of which is to observe any angle, whose vertex is at the centre of the instrument in any plane (though it is most commonly horizontal, or nearly so) and to find how many degrees it contains.

Graphometers of various kinds have been lately contrived by Mr. Bancks and others, to measure the angles of crystals.

GRAPNELS, a sort of anchors with four flooks, serving for boats to ride by.

There is also a kind called fire and chain-grapnels, made with four-barbed claws instead of flooks, and used to catch hold of the enemies' rigging, or any other part, in order for boarding them. See Pl. 76, fig. 7.

To GRA'PPLE. *v. n.* (*krappeln*, German.) 1. To contend by seizing each other (*Milton*). 2. To contest in close fight (*Dryden*).

To Gra'pple. *v. a.* 1. To fasten; to fix; obsolete (*Shakspeare*). 2. To seize; to lay fast hold of (*Heylin*).

Gra'pple. *s.* (from the verb.) 1. Contest, in which the combatants seize each other (*Milton*). 2. Close fight (*Shakspeare*). 3. Iron instrument by which one ship fastens on another (*Dryden*).

GRA'PPLEMENT. *s.* (from *grapple.*) Close fight: not in use (*Spenser*).

GRA'SHOPPER. *s.* (*grass* and *hop.*) A small insect that hops in the summer grass (*Addison*). See Cicada.

GRA'SIER. See Grazier.

To GRASP. *v. a.* (*graspare*, Italian) 1. To hold in the hand; to gripe (*Sidney*). 2. To seize; to catch at (*Clarendon*).

To Grasp. *v. n.* 1. To catch; to endeavour to seize (*Swift*). 2. To struggle; to strive: not in use (*Shakspeare*). 3. To gripe; to encroach (*Dryden*).

Grasp. *s.* (from the verb.) 1. The gripe or seizure of the hand (*Milton*). 2. Possession; hold (*Shakspeare*). 3. Power of seizing (*Clarendon*).

GRA'SPER. *s.* (from *grasp.*) One that grasps.

GRASMERE WATER, a small lake of Westmoreland, to the W. of Ambleside. Its margin is hollowed into small bays, with bold eminences, some of rock, some of turf, that half conceal and vary the figure of the lake. From the shore, a low promontory projects far into

the water; and on it stands a white village, *with the parish church rising in the midst of it.*

GRASON, an island in the gulf of Bothnia, near the coast of Sweden. Lat. 60. 12 N. Lon. 18. 12 E.

GRASS, a well-known vegetable food for cattle of all sorts. The grasses are a very numerous family, though all are not equally beneficial in their culture, some animals preferring one sort, and some another. See GRAMINA and HUSBANDRY.

The two best species of grass for pastures are, in Miller's opinion, C. Bauhin's gramen pratense, paniculatum majus, angustiore folio, meadow-grass, with large panicles, and a narrower leaf, which is the poa paniculâ diffusa spiculis, quadrifloribus pubescentibus culmo erecto teretri, Flor. Suec. 77. Poa with a diffused panicle, the smaller spikes having four hairy flowers, and a taper erect straw; and C. Bauhin's gramen pratense, paniculatum majus, latiore folio, meadow-grass, with a larger panicle, and broader leaf, which is the poa aniculâ diffusâ, spiculis trifloribus glabris, culmo erecto teretri, Flor. Suec. 76. Poa with a diffused panicle, small spikes with three flowers, and an upright straw.

These seem to be the great meadow-grasses, and Stillingfleet observes, that they are common in our best meadow-grounds. He has also met with them frequently on banks by the road-side, and near ditches, even where they were not to be found in the adjoining meadows and pastures.

If the seeds of these two sorts were carefully collected and sown separately, without any mixture of the seed of other grass, they would not only afford a greater quantity of fodder on the same space of land, but the grass would also be better, the hay sweeter, and the verdure more lasting, than that of any other species.

The annual meadow-grass makes the finest of turfs. It grows every where by way-sides, and on rich sound commons. It is called in some parts the Suffolk grass. Stillingfleet says, he has seen whole fields of it in High Suffolk, without any mixture of other grasses; and, as some of the best salt butter we have in London comes from that country, it is most likely to be the best grass for the dairy.

As the next best to meadow-grass, Miller recommends Ray's gramen avenaceum pratense elatius, paniculâ flavescente, locustis parvis, taller meadow oat-grass, with a yellowish panicle and small husks, which is the avena paniculâ laxâ, calycibus trifloris brevibus flosculis omnibus aristatis, Prod. Leyd. 66. Oat-grass with a loose panicle, three flowers in each impalement, which is short, and all the flowers having awns. Mr. Ray likewise recommends the smooth mountain oat-grass, which he calls gramen avenaceum montanum spicâ simplici, aristis recurvis, found by Mr. Dale upon Bartlow-hills in Essex, on the edge of Cambridgeshire, in the borders of the corn-fields between Newmarket and Exning, and on the chalk-hills between Northfleet and Gravesend; and the rough or hairy oat-grass, which he distinguishes by the appellation of gramen avenaceum hirsutum, paniculâ purpureo argenteâ splendente, and which abounds in the pastures about the earl of Cardigan's house at Twickenham, in Middlesex. He also includes under this genus all the festuca kinds, of which Mr. Stillingfleet gives an account in his Observation on Grasses, subjoined to his translations of several ingenious tracts, selected from the Transactions of the Academy of Upsal. Our business, however, is not with the culture of grass, but with its properties as an article of food.

Grasses and the other green herbage, of which our fields afford sufficient store of various kinds, are in general the most natural food of horses, as well as of many other brute creatures; yet grass alone is not sufficiently nourishing for a horse destined to hard labour, without an addition of dry provender. Most spare horses in the country, however, are kept at grass, both to save charge and trouble, and for the most part do well, especially those that are habituated to that kind of living. Many gentlemen keep their hunters abroad all the year, where there is a stable in some convenient dry field, with hay at all times for them to come to when they please, and where they can shelter themselves from the inclemency of the weather. These horses are seldom sick or diseased; and as they move and rest themselves at pleasure, so their limbs are always clean and dry; and, with a feed or two of corn, they will do their morning's work, and go through a chace as well, and frequently better, than those that are kept constantly in the house, and have a great deal of airing and dressing bestowed on them.

Farmers keep most of their horses abroad in the winter, where they take their chance till the frost and snow come on. or very rainy weather, when the grounds grow potchy, and then they fodder them in their yards, or near their houses, so as they can come into the stables or under shades, which some build for the convenience of their cattle.

But those who have not such conveniences of their own ought to be at some pains in procuring grass for their horses, and proper places for them to run in during the winter, when they have no use for them, especially such as live in London or other great towns. But it is necessary that the grass be sweet; for rank sour grass is rather worse than the hay that comes off the same ground, provided it happens to be well got and in a good season, the noxious qualities in the herb being in some measure evaporated in drying. That grass is always reckoned the best which is short, thick, and on dry but on fertile ground that needs little manure, especially such as has always been made use of only as pasture. Therefore most horses thrive better on commons, or on the grass that grows near commons, than on meadows that have been often mowed, and have had great crops of hay taken off them from time to time, and therefore must either be manured or sowed

afresh with clover. For though horses will grow fast upon such grounds when they have good water, yet they are not apt to hold their flesh, nor to stand so well afterwards, unless in very dry seasons, when they feed altogether on the root, on which bare pasture horses will grow extremely fat.

Gibson thinks the fields which lie near great towns, and that are much dunged, cannot be so proper either for hay or pasture, as those that lie more in the country, and are not so much forced or exhausted with heavy crops; and he says he has often observed, where the grounds were naturally poor, that though they are made to yield plentiful crops to the owner, yet it often proves injurious to the horses that feed upon them, especially if they run the whole summer. We cannot, however, see any good reason for this supposition.

In another place this judicious writer notices more particularly the advantages which horses usually receive from feeding on grass, and points out which of these stand most in need of, and are most benefited by it. Such, he observes, as have stood long in the stable, glutted with food, suffocated with heat and want of air, and enervated for want of exercise, though clean fed, are nevertheless apt to grow full of humours; and these require a considerable run at grass before they are fit for business. Indeed, grass, as it is their most natural food, is a great benefit to them; and, when horses do not thrive at grass, it is often owing to some mismanagement, which requires to be looked into and rectified. We have, however, already noticed this part of the subject under the article FOOD.

This writer's observations concerning the use of grass, as a remedy in morbid cases, are very judicious. He says, that grass gives great relief to broken-winded horses while they continue abroad, "not only because they are always in the open free air, and ranging at pleasure about the fields, but because their diet is also both soft and cooling, and passes more easily through them than hard meat, besides that grass does not so much excite them to drink;" so that those persons who can conveniently keep such horses always abroad, and only take them up when they have occasion to use them, and after that turn them out again directly, may thus preserve them in tolerable health, and they will continue, under prudent management, to do good service for many years. Such, however, as send their horses to grass with a view to cure them of broken wind will find themselves greatly disappointed, especially if they are left to remain abroad after the spring grass; for, in that case, as soon as a horse is brought back to stand in the stable, being deprived of the pure air and his natural diet, he will become much more oppressed and short-breathed than before. "Instances of this kind," says Gibson, "are frequent, as also of horses that have been sent to grass to cure an obstinate cough, and have returned from thence completely broken-winded, especially where they have been turned into a succulent rich pasture, and have grown fat, and had their bellies always full; and the oftener such horses are turned out, the worse they always become: and therefore those who have not the convenience of grass near their houses will find it more for their interest to keep such horses always at home, under some proper and exact management, especially if they are young, and otherwise worth the care and expence that may be necessary to preserve them; and if a cool open diet should be judged wanting, they may be fed a month or six weeks in the spring with green barley, tares, or any other kind of herbage fit for soiling, especially while it is young and full of juice."

To GRASS. *v. n.* To breed grass (*Tusser*).

GRASS-HOPPER, in entomology. See CICADA and GRYLLUS.

GRASS-PLOT. (*grass* and *plot.*) A small level covered with short grass (*Mortimer*).

GRASSE, a town of France, in the department of Var. It was lately a bishop's see. Lat. 43. 39 N. Lon. 5. 56 E.

GRASSE, a town of France, in the department of Aude, seated on the river Othieu, 18 miles S.E. of Carcassone.

GRA'SSINESS. *s.* (from *grassy.*) The state of abounding in grass.

GRA'SSY. *a.* (from *grass.*) Covered with grass; abounding with grass (*Dryden*).

GRATE. *s.* (*crates*, Latin.) 1. A partition made with bars placed near to one another, or crossing each other (*Addison*). 2. The range of bars within which fires are made (*Spect.*).

To GRATE. *v. a.* (*gratter*, French.) 1. To rub or wear any thing by the attrition of a rough body (*Spenser*). 2. To offend by any thing harsh or vexatious (*Swift*). 3. To form a sound by collision of asperities or hard bodies (*Milton*).

To GRATE. *v. n.* 1. To rub so as to injure or offend (*L'Estrange*). 2. To make a harsh noise (*Hooker*).

GRA'TEFUL. *a.* (*gratus*, Latin.) 1. Having a due sense of benefits (*Milton*). 2. Pleasing; acceptable; delightful; delicious (*Bacon*).

GRA'TEFULLY. *ad.* 1. With willingness to acknowledge and repay benefits; with due sense of obligation (*Dryden*). 2. In a pleasing manner (*Watts*).

GRA'TEFULNESS. *s.* (from *grateful.*) 1. Gratitude; duty to benefactors (*Herbert*). 2. Quality of being acceptable; pleasantness.

GRA'TER. *s.* (*gratoir*, French.) A kind of coarse file with which soft bodies are rubbed to powder (*A. Hill*).

GRATIAN, father of the emperor Valentinian I. was a native of Pannonia, which now bears the name of Hungary. He was celebrated for his personal strength and his courage, and rose by degrees to the command of the Roman army in Africa. Having excited jealousy at Rome, by his enmity to the pagan superstitions, he retired to Gaul, where he fell in fighting against his rebellious subjects A.D. 383.

GRATIAN, son of Valentinian by the empress Severa, succeeded to the empire in 375.

He was an accomplished prince. He was the first Roman emperor who refused the title of Pontifex Maximus. He was assasinated by Andragathus in the 24th year of his age.

Gratian, a famous Benedictine monk, in the 12th century, was born at Chiusi, and employed near twenty-four years in composing a work, entitled Decretum, or Concordantia Discordantium Canonum, because he there endeavoured to reconcile the canons which seemed contradictory to each other. This work he published in 1151. As he is frequently mistaken in taking one canon of one council, or one passage of one father for another, and has often cited false decretals, several authors have endeavoured to correct his faults; and chiefly Anthony Augustine, in his excellent work, enti ed' De emendatione Gratiani. To the decretals of Gratian the popes principally owed the great authority they exercised in the thirteenth and following centuries.

GRATIFICATION. *s.* (*gratificatio*, Lat.) 1. The act of pleasing (*South*). 2. Pleasure; delight (*Rogers*). 3. Reward; recompense.

To GRATIFY. *v. a.* (*gratificor*, Latin.) 1. To indulge; to please by compliance (*Dryden*). 2. To delight; to please (*Addison*). 3. To requite with a recompense.

GRATINGLY. *ad.* (from *grate.*) Harshly; offensively.

GRATINGS, in a ship, are small ledges of sawed plank, framed one into another like a lattice or prison grate, lying on the upper deck, between the main-mast and fore-mast, serving for defence in a close fight, and also for the coolness, light, and conveniency of the ship's company.

GRATIOLA. Hedge-hyssop. In botany, a genus of the class diandria, order monogynia. Corol irregular, reversed; calyx mostly seven-leaved, the two outer ones expanded; stamens two, steril; capsule two-celled. Fifteen species; chiefly Indian and American plants, but a few European. The only species worthy of notice is G. officinalis, a native of the south of Europe, with lanceolate, serrate, opposite, sessile leaves; flowers peduncled, solitary, axillary. This plant was formerly a favourite article in many pharmacopœias; and is still employed in Germany as a violent cathartic and emetic, especially in hydropic cases, in which it is said to be peculiarly successful. It has also been recommended as an antisiphilitic.

GRATIS. *ad.* (Latin.) For nothing; without a recompence (*Arbuthnot*).

GRATITUDE. *s.* (*gratitudo*, low Latin.) A pleasant affection excited by a lively sense of benefits received or intended, or even by the desire of being beneficial. In its strength it is the powerful re-action of a well disposed mind, upon whom benevolence has conferred some important good. It is always connected with an impressive sense of the amiable disposition of the person by whom the benefit is conferred, and it immediately produces a personal affection toward him. When the affection operates according to the natural course of influence, it will be correspondent to the importance of the good obtained, the distance in station between the recipient and his benefactor, the smallness of his claims, perhaps the consciousness of deserving very opposite treatment. These circumstances unite to warm the heart into raptures. The grateful mind is impatient of a silent and passive reception of the blessing. It cannot be restrained from acknowledging its obligations, either by expressions or deeds. It considers every return in its power as an act of the strictest justice; nor is it deterred by difficulties or dangers from making the attempt. The term most familiarly employed was originally suggested by this idea. The *obligation* is perceived and felt; and the person benefited considers himself as *bound* in honour and justice, either to repay or acknowledge the debt, by a bond that cannot be cancelled. We shall not wonder at the peculiar strength and energy of this affection, when we consider that it is compounded of *love* placed upon the good communicated, *affection* for the donor, and *joy* at the reception. Thus it has goodness for its object, and the most pleasing, perhaps *unexpected*, exertions of goodness for its immediate cause. (*Cogan on the Passions*).

There is a species of grateful remorse, which sometimes has been known to operate forcibly on the minds of the most hardened in impudence. Of this Mr. Andrews, who makes the remark, gives an instance in the following anecdote, said to have been a favourite one with the late Dr. Campbell: "Towards the beginning of this century, an actor, celebrated for mimicry, was to have been employed by a comic author, to take off the person, the manner, and the singularly awkward delivery of the celebrated Dr. Woodward, who was intended to be introduced on the stage in a laughable character (viz. in that of Dr. Fossile, in Three Hours after Marriage.) The mimic dressed himself as a countryman, and waited on the doctor with a long catalogue of ailments, which he said attended on his wife. The physician heard with amazement diseases and pains of the most opposite nature, repeated and redoubled on the wretched patient. For, since the actor's greatest wish was to keep Dr. Woodward in his company as long as possible, that he might make the more observations on his gestures, he loaded his poor imaginary spouse with every infirmity which had any probable chance of prolonging the interview. At length, having become completely master of his errand, he drew from his purse a guinea, and, with a scrape, made an uncouth offer of it. 'Put up thy money, poor fellow,' (cried the doctor); 'thou hast need of all thy cash and all thy patience too, with such a bundle of diseases tied to thy back.' The actor returned to his employer, and recounted the whole conversation, with such true feeling of the physician's character, that the author screamed with approbation. His raptures were soon checked; for the mimic told him, with the emphasis of sensibility, that he would sooner die than prostitute his talents to the rendering such genuine

humanity a public laughing-stock. The player's name was Griffin."

GRATZ, a town of Germany, capital of Stiria, with a castle, and a university. It is seated on the Muehr. Lat. 47. 20 N. Lon. 15. 30 E.

GRATU'ITOUS. *a.* (*gratuitus*, Latin.) 1. Voluntary; granted without claim or merit (*L'Estrange*). 2. Asserted without proof (*Ray*.)

GRATU'ITOUSLY. *ad.* 1. Without claim or merit. 2. Without proof (*Cheyne*).

GRATU'ITY. *s.* (*gratuité*, Fr.) A present or acknowledgment; a free gift (*Swift*).

To GRA'TULATE. *v. a.* (*gratulor*, Latin.) 1. To congratulate; to salute with declarations of joy (*Shaks.*) 2. To declare joy for (*Ben Jonson*).

GRATULA'TION. *s.* (*gratulatio*, Lat.) Salutations made by expressing joy (*Hooker*).

GRA'TULATORY. *a.* (from *gratulate.*) Congratulatory; expressing congratulation.

GRAUDENTZ, a town of Poland, in the palatinate of Culin, with a castle, seated on the Vistula. Lat. 53. 36 N Lon. 18. 52 E.

GRAVE, a strong town of Dutch Brabant, seated on the Maese, beyond which there is a fort. Lat. 51. 47 N. Lon. 5. 45 E.

GRAVE, in grammar, a species of accent opposite to acute. The grave accent is expressed thus (`), and shows that the voice is to be depressed, and the syllable over which it is placed pronounced in a low deep tone.

GRAVE, in music, is applied either to *tone* or *time*. 1. Grave when applied to tone denotes that it is low or deep in comparison with some other. 2. In time it denotes a movement between largo and adagio.

GRAVE, a final syllable in the names of places, is from the Saxon ᵹꞃæꝼ, a grove or cave (*Gibson*).

GRAVE. *s* (ᵹꞃæꝼ, Saxon.) The place in the ground in which the dead are reposited (*Milton*).

GRAVE-CLOTHES. *s.* (*grave* and *clothes*.) The dress of the dead (*Spenser*).

GRAVE-STONE. *s.* (*grave* and *stone*.) The stone that is laid over the grave (*Shakspeare*).

To GRAVE. *v. a.* preter. *graved*; part. pass. *graven*. (*graver*, French; γραφω.) 1. To insculp; to carve a figure or inscription in any hard substance (*Prior*). 2. To carve or form (*Hebrews*). 3. (from the noun.) To entomb (*Shakspeare*). 4. To clean, caulk, and sheath a ship (*Ainsworth*).

To GRAVE. *v. n.* To write or delineate on hard substances (*Exodus*).

GRAVE. *a.* (*grave*, French.) 1. Solemn; serious; sober (*More*). 2. Not futile; credible (*Grew*). 3. Not showy; not tawdry.

GRAVEL, in oryctology. See SAND.

GRAVEL, a disorder. See MEDICINE.

To GRA'VEL. *v. a.* (from the noun.) 1. To pave or cover with gravel (*Bacon*). 2. To stick in the sand (*Camden*). 3. To puzzle; to stop; to put to a stand (*Shakspeare*).

GRAVELLED, in the manage, is affirmed of a horse when fragments of flints, or small pebbles, have insinuated themselves between the outer sole of the foot and the web of the shoe. This injury seldom occurs, but when the shoe is formed too flat upon the inner surface, without its proper concavity; and consequently confines by its close pressure whatever extraneous substance gains admission. The shoe should in such case be tenderly taken off, by one nail at a time, in preference to tearing it off by main and sudden force, as is most usual; the sole should be well fomented with good hot milk and water, then covered with an emollient poultice of linseed powder, milk, and two table spoonsful of olive oil, letting the same be repeated daily, till the inflammation has subsided, and the tenderness gone off; when the bottom of the hoof may be hardened by two or three applications of a sponge dipt in vinegar boiling hot before the shoe is replaced.

GRA'VELESS. *a.* (from *grave.*) Wanting a tomb; unburied (*Shakspeare*).

GRAVELINES, a strong seaport of France, in the department of the North. It is seated on the Aa. Lat. 50. 59 N. Lon. 2. 13 E.

GRA'VELLY. *a.* (*graveleux*, French.) Full of gravel; abounding with gravel (*Harvey*).

GRA'VELY. *ad.* (from *grave.*) 1. Solemnly; seriously; soberly; without lightness or mirth (*Spectator*). 2. Without gaudiness or show.

GRAVENAC, a town of Suabia, capital of a county of the same name. Lat. 48. 22 N. Lon. 9. 28 E.

GRA'VENESS. *s.* (from *grave.*) Seriousness; solemnity and sobriety of behaviour (*Denham*).

GRA'VEOLENT. *a.* (*graveolens*, Latin.) Strong scented.

GRA'VER. *s.* (*graveur*, French.) 1. One whose business is to inscribe or carve upon hard substances; one who copies pictures upon wood or metal to be impressed on paper (*Dryden*). 2. The style or tool used in graving (*Boyle*).

GRAVESANDE (William James), celebrated for his knowledge of the mathematics and astronomy, was born in 1688, at Delft in Holland. He was educated to the profession of the civil law; and practised some time at the Hague. He was one of the authors of the Journal Littéraire, published there. But he was afterwards made professor of mathematics and astronomy at Leyden; and was the first who taught the Newtonian philosophy at that university. He died in 1742.

Gravesande was a man amiable in his private character, and respectable in his public one; for few men of letters have rendered more eminent services to their country. The ministers of the republic consulted him on all occasions when his talents were requisite to assist them, which his skill in calculation often enabled him to do in money matters. He was of great service as a decypherer, in detecting the secret correspondence of their enemies. And in his own profession none ever applied the powers of nature with more success, or to more useful purposes.

Of his publications the principal are, 1. An *Introduction to the Newtonian Philosophy.* 2. The Elements of Algebra. 3. An Essay on Perspective. 4. A new Theory of Collision. 5. A Course of Logic and Metaphysics. Professor Allamand published an edition of his Mathematical and Philosophical Works, in 2 vols. 4to.

GRAVESEND, a town of England, in the county of Kent, on the south side of the Thames, and the first port on that river. In the time of Richard II., this town was taken and burned by the French and Spaniards, on which account, perhaps, as a compensation, the inhabitants, with those of Milton, obtained the exclusive privilege of conveying passengers from thence to London, on condition that they should provide boats on purpose, and carry all persons, either at two-pence per head, with his bundle, or the whole boat's fare should be four shillings. This charter has been confirmed by succeeding princes, and under proper regulations they still enjoy this advantageous privilege. The fare is now eighteen-pence each passenger. The boats are large and commodious, and much improved within these few years; they are obliged to depart on the ringing of a bell a quarter of an hour; they go to London with every flood, and return from Billingsgate on the like signal with every ebb. For its better security, Henry VIII. raised a platform of guns to the east of the town, and erected a fort directly opposite, at Tilbury, on the Essex shore, which is a regular fortification, has a battery commanding the river mounted with above 100 pieces of cannon, carrying balls from twenty-four to forty-six pound weight. Queen Elizabeth ordered the lord mayor of London, the aldermen, and all the companies, to receive all eminent strangers and ambassadors at Gravesend, in their formalities; and attend them to London in their barges, if they went by water; if they went by land, they were to meet them on horseback, in their gowns, on Blackheath.

Gravesend is a corporation town, and, together with Milton, governed by a mayor, jurats, and common-council men. The town-house, where all public business is transacted, was built in the year 1764. There are two markets weekly, Wednesday and Saturday, and a fish-market every Sunday morning. All outward bound ships are obliged to cast anchor before the town, till they have been examined by, and obtained proper clearances from, searchers, appointed for that purpose, who have an office near the town quay: a centinel is also stationed at the block-house, below the town, to give notice by the firing of a musket, when ships are coming up the river, who are obliged to receive on board officers from the customs, a number of which are constantly waiting here for that purpose. Lat. 51. 25 N. Lon. 0. 27 E.

GRA'VIDITY. *s.* (*gravidus,* Lat.) Pregnancy; state of being with child (*Arbuthnot*).

GRAVIMETER, the name given by M. Guyton to an instrument for measuring specific gravities: he adopts this name rather than *either areometer or hydrometer, because these latter terms are grounded upon the supposition* that a fluid is always the thing weighed; whereas, with regard to solids, the liquid is the known term of comparison to which the unknown weight is referred. Guyton's gravimeter is executed in glass, and is of a cylindric form, being that which requires the smallest quantity of fluid, and is on that account preferable, except so far as it is necessary to deviate for the security of a vertical position. It carries two basins, one of them superior, at the extremity of a thin stem, towards the middle of which the fixed point of immersion is marked. The other, or lower basin, terminates in a point; it contains the balls, and is attached to the cylinder by two branches. The moveable suspension, by means of a hook, has the inconvenience of shortening the level which is to secure the vertical position. The cylinder is three fourths of an inch in diameter, and 6.85 inches in length. It carries in the upper basin an additional constant weight of five grammes, or one hundred and fifteen grains. These dimensions might be increased so as to render it capable of receiving a much more considerable weight; but this is unnecessary. M. Guyton has added a piece which he calls the plonguer, because, in fact, it is placed in the lower basin when used, and is consequently entirely immersed in the fluid. It is a bulb of glass loaded with a sufficient quantity of mercury, in order that its total weight may be equal to the constant additional weight added to the weight of the volume of water displaced by this piece. It will be readily understood that the weight being determined at the same temperature at which the instrument was originally adjusted, it will sink to the same mark on the stem, whether it is loaded with a constant additional weight in the upper basin, or whether the effect of this weight be produced by the additional piece in the lower dish. From this explanation there will be no difficulty in seeing how this instrument may be adapted to every case in practice. It may be used, 1. For solids. The only condition will be, that the absolute weight of the body to be examined shall be rather less than the constant additional weight, which in this instrument is about 115 grains. 2. For liquids of less specific gravity than water, the instrument, without the additional weight above-mentioned, weighs about four hundred and fifty-nine grains, in the dimensions before laid down. It would be easy to limit its weight to the utmost accuracy. We have therefore the range of one-fifth of buoyancy, and consequently the means of ascertaining all the intermediate densities from water to the most highly rectified spirit of wine, which is known to bear in this respect the ratio of eight to ten with regard to water. 3. When liquids of greater specific gravity than water are to be tried, the constant weight being applied below by means of the additional piece, which weighs about one hundred and thirty-eight grains, the i

strument can receive in the upper basin more than four times the usual additional weight, without losing the equilibrium of its vertical position. In this state it is capable of shewing the specific gravity of the most concentrated acids. 4. It possesses another property, namely, that it may be used as a balance to determine the absolute weight of such bodies as do not exceed its additional load. 5. Lastly, the purity of the water being known, it will indicate the degrees of rarefaction and condensation in proportion to its own bulk. To find the specific gravity of any solid by the gravimeter, observe this rule: "From the weight in the upper dish, when the instrument is properly immersed in the unknown fluid, take the weight which is placed with the body in the same scale at the like adjustment. The remainder is the absolute weight of the solid. Multiply this by the specific gravity of the fluid, and reserve the product. From the additional weight, when the body is placed in the lower basin, take the weight when it was placed in the upper. The remainder will be the loss of weight by immersion. Divide the reserved product by the loss by immersion, and the quotient will be the specific gravity of the solid with regard to distilled water at the standard temperature and pressure." To find the specific gravity of a fluid, proceed thus: "To the weight of the gravimeter add the weight required in the upper basin to sink it in the unknown fluid." Again, "To the weight of the gravimeter add the weight required in the same manner to sink it in distilled water. Divide the first sum by the latter, and the quotient will be the specific gravity of the fluid in question." See SPECIFIC GRAVITY, HYDROSTATICS, and HYDROMETER.

GRAVINA, a town of Italy, in the kingdom of Naples. Lat. 41. N. Lon. 17. E.

GRAVING. See ENGRAVING. In sea affairs the word graving is used for the act of cleaning a ship's bottom, when she is laid aground during the recess of the tide. See BREAMING and CAREENING.

To GRA'VITATE. *v. n.* (from *gravis*, Latin.) To tend to the centre of attraction (*Bentley*).

GRAVITA'TION. *s.* (from *gravitate.*) Act of tending to the centre (*Pope*).

GRA'VITY. *s.* (*gravitas*, Latin.) 1. Weight; heaviness; tendency to the centre (*Brown*). 2. Atrociousness; weight of guilt (*Hooker*). 3. Seriousness; solemnity (*Bacon*).

GRAVITY, in physics, the natural tendency or inclination of bodies towards the centre. And in this sense gravity agrees with centripetal force.

Particular Gravity, is that which respects the earth, or by which bodies descend, or tend towards the centre of the earth; the phenomena or properties of which are as follow:

1. All circumterrestrial bodies do hereby tend towards a point, which is either accurately or very nearly the centre of magnitude of the terraqueous globe. Not that it is meant that there is really any virtue or charm in the point called the centre, by which it attracts bodies; but because this is the result of the gravitation of bodies towards all the parts of which the earth consists.

2. This point or centre is fixed within the earth, or at least has been, so far as any authentic history reaches.

3. In all places equidistant from the centre of the earth, the force of gravity is equal, *cæteris paribus*. The force of gravity is not equal on all parts of the earth's surface, for two reasons: 1. All parts of the surface are not equidistant from the centre, the earth being spheroidical: 2. The gravity is different in different latitudes, by reason of the variation in the centrifugal force, occasioned by the earth's rotation: the increment of gravity on this account being as the square of the cosine of the latitude. M. Krafft's formula for the proportion of gravity in different latitudes was given under the article EARTH.

4. Gravity equally affects all bodies, without regard either to their bulk, figure, or matter; so that, abstracting from the resistance of the medium, the most compact and loose, the greatest and smallest bodies would all descend through an equal space in the same time: as appears from the quick descent of very light bodies in an exhausted receiver. The space which bodies do actually fall, in vacuo, is $16\frac{1}{12}$ feet in the first second of time, in the latitude of London; and for other times, either greater or less than that, the spaces descended from rest are directly proportional to the squares of the times, while the falling body is not far from the earth's surface.

5. This power is the greatest at the earth's surface, from whence it decreases both upwards and downwards, but not both ways in the same proportion; for upwards the force of gravity is less, or decreases, as the square of the distance from the centre increases; but below the surface, the power decreases in such sort that its intensity is in the direct ratio of the distance from the centre.

6. As all bodies gravitate towards the earth, so does the earth equally gravitate towards all bodies; as well as all bodies towards particular parts of the earth, as hills, &c. which has been proved by the attraction a hill has upon a plumb line, insensibly drawing it aside. Hence the gravitating force of entire bodies consists of those of all their parts: for by adding or taking away any part of the matter of a body, its gravity is increased or decreased in the proportion of the quantity of such portion to the whole mass. Hence also the gravitating powers of bodies, at the same distance from the centre, are proportional to the quantities of matter in the bodies.

General or universal Gravity, is that in consequence of which all the planets tend to one another, and indeed all the bodies and particles of matter in the universe tend towards one another.

The process by which the mind of sir Isaac Newton was led to the conclusion respecting universal gravity, has been described in the following manner. Having made the great discovery of an universal and mutual deflection of all the matter in the solar system, he was one day speculating on this subject, and comparing it with other deflections which he observed among bodies, such as magnets, &c. He considered terrestrial gravity as a force of this kind. By the weight of terrestrial bodies they kept united with the earth. By its weight was the water of the ocean formed into a sphere. This force extended, without any remarkable diminution, to the tops of the highest mountains. Might it not reach much farther?

May it not operate even at the distance of the moon? In the same manner that the planetary force deflects the moon from the tangent to her orbit, and causes her to describe an ellipse, the weight of a cannon ball deflects it from the line of its direction, and makes it describe a parabola. What if the deflecting force which incurvates her path towards the earth be the simple weight of the moon? If the weight of a body be the same with the general planetary force, it will diminish as the square of its distance from the earth increases. Therefore, said he, since the distance of the moon from the centre of the earth is about 50 times greater than the distance of the stone which I throw from my hand, and which is deflected 16 feet in one second, the weight of this stone, if taken up to the height of the moon, should be reduced to the 2500th part, and should there deflect $\frac{1}{2500}$th of 16 feet in a second; and the moon should deflect as much from the tangent in a second. Having the dimensions, as he thought, of the moon's orbit, he immediately computed the moon's deflection in a second; but he found it considerably different from what he wished it to be. He therefore concluded that the planetary force was not the weight of the planet. For some years he thought no more of it: but one day, in the Royal Society, he heard an account read of measurements of a degree of the meridian, which showed him that the radius of the earth and the distance of the moon were very different from what he had believed them to be. When he went home he repeated his computation, and found, that the deflection of a stone was to the simultaneous deflection of the moon as the square of the moon's distance from the centre of the earth to the square of the stone's distance. Therefore the moon is deflected by its weight; and the fall of a stone is just a particular instance of the exertion of the universal planetary force. This computation was but roughly made at first; but it was this coincidence that excited the philosopher to a more attentive review of the whole subject. When every circumstance which can affect the result is taken into account, the coincidence is found to be most accurate. The fall of the stone is not the full effect of its weight; for it is diminished by the rotation of the earth round its axis: it is also diminished by the weight of the air which it displaces: it is also diminished by its tendency to the moon. On the other hand, the moon does not revolve round the earth, but round a common centre of the earth and moon, and its period is about $\frac{1}{110}$th shorter than if it revolved round the earth; and the moon's deflection is affected by the sun's disturbing force. But all these corrections can be accurately made, and the ratio of the full weight of the stone to the full deflection of the moon ascertained. This has been done.

Terrestrial gravity therefore, or that power by which bodies fall or press on their supports, is only a particular instance of that general tendency by which the planets are retained in their orbits. Bodies may be said to gravitate when they give indications of their being gravis or heavy, that is, when they fall or press on their supports; therefore the planets may be said to gravitate when they give similar indications of the same tendency by their curvilineal motions. The general fact, that the bodies of the solar system are mutually deflected toward each other, may be expressed by the verbal noun gravitation. Gravitation does not express a quality, but an event, a deflection, or a pressure.

The weight of a terrestrial body, or its pressure *on its support, is the effect of the accumulated gravitation of all its particles; for bodies of every* kind of matter fall equally fast. This has been ascertained with the utmost accuracy by sir Isaac Newton, by comparing the vibrations of pendulums made of every kind of matter. Therefore their united gravitation is proportional to their quantity of matter; and we have concluded, that every atom of terrestrial matter is heavy, and equally heavy. We extend this conclusion to the sun and planets, and say that the observed gravitation of a planet is the united gravitation of every particle. Therefore sir Isaac Newton inferred, from a collective view of all the phenomena, that all matter gravitates to all matter with a force in the inverse duplicate ratio of the distance.

But we do not think that this inference is absolutely certain: though we acknowledge that the experiments on pendulums, consisting of a vast variety of terrestrial matter, all of which performed their oscillations in equal times, demonstrate that the acceleration of gravity on those pendulums was proportional to their quantities of matter, and that equal gravitation may be affirmed of all terrestrial matter.

The elliptical motion of a planet is full proof that the accelerating power of its gravity varies in the inverse duplicate ratio of the distance; and the proportionality of the squares of the periods to the cubes of the distances, shows that the whole gravitations of the planets vary by the same law. But this third observation of Kepler might have been the same, although the gravitation of a particle of matter in Jupiter had been equal to that of a particle of terrestrial matter, provided that all the matter in Jupiter did not gravitate. If $\frac{1}{4}$th of Jupiter had been such gravitating matter, his deflection from the tangent of his orbit would have been the same as at present, and the time of his revolution would have been what we observe. In order that the third law of Kepler may hold true of the planetary motions, no more is required than that the accumulated gravitation of the planet be proportional to its quantity of matter, and thus the matter which does not gravitate will be compensated by the superior gravitation of the rest.

But because we have no authority for saying that there is matter which gravitates differently from the rest, or which does not gravitate, we are entitled to suppose that gravity operates alike on all matter.

And this is the ultimatum of the Newtonian philosophy, that the solar system consists of bodies composed of matter, every particle of which is, in fact, continually deflected by its weight toward every other particle in the system; and that this deflection, or actual deviation, or actual pressure, tending to deviation from uniform rectilineal motion, is in the inverse duplicate ratio of their distance.

This doctrine is called the system of universal gravitation; but it has been blamed as introducing an unphilosophical principle into science. Gravitation is said to be an occult quality; and therefore as unfit for the explanation of phenomena as any of the occult qualities of Aristotle. But this reproach is unfounded; gravitation does not express any quality whatever, but a matter of fact, an event, an actual deflection, or an actual pressure, producing an actual deflection of the body pressed. These are not occult, but matters of continual observation. True, indeed, Newton

does not deny, although he does not positively say, that this deflection, pressure or gravitation, is an effect *having a cause*. Gravity is said to be this cause. *Gravity is the being gravis or heavy*, and gravitation is the giving indications of being heavy. Heaviness therefore is the word which expresses gravitas, and our notion of the cause of the planetary deflections is the same with our notion of heaviness. This may be indistinct and unsatisfactory to a mind fastidiously curious; but nothing can be more familiar. The planet is deflected, because it is heavy. We are supposed to explain the fall of a stone through water very satisfactorily, and without having recourse to any occult quality, when we say that it is heavier than the water; and we explain the rise of a piece of cork, when we say that it is not so heavy as the water. The explanations of the mutual actions of the planets are equally satisfactory, founded on the same principles, and equally free from all sophistry or employment of occult causes. The weight of a body is not its heaviness, but the effect of its heaviness. It is a gravitation, an actual pressure, indicated by its balancing the supposed heaviness of another body, or by its balancing the known elasticity of a spring, or by balancing any other natural power. It is similar to the pressure which a magnet exerts on a piece of iron. Whether either of these be produced by the impulse of a stream of fluid, is a question with which we need not concern ourselves. We gain a most extensive and important knowledge, by our acquaintance with this universal law; for we can now explain every phænomenon, by pointing out how it is contained in this law; and we can predict the events of the solar system almost within the beat of a clock. This, one would think, ought to satisfy the most inquisitive mind. But, *Nitimur, in vetitum, semper cupimusque negata.* There seems to be a fatal and ruinous disposition in the human mind, a sort of priapism of the understanding, that is irritated by every interdict or natural imperfection. We would take a microscope to look at light; we would know what knowing is, and we would weigh heaviness.

From the time of Aristotle down to the present day, the world has been entertained with various philosophical whimsies on this subject. As an historical account of them would be of no real advantage to science, we shall not attempt any thing of the kind. We shall merely remark, that, of late, many attempts have been made to trace the planetary deflections to their origin in the motion of some impelling matter; yet these attempts could not be successful, because they are all built upon hypotheses. Much has been said respecting an ætherial medium (see ÆTHER), which adds nothing to our real knowledge. Even if the legitimate consequences of this ætherial hypothesis were consistent with the phænomena, we have not obtained any explanation. We have only learned that the appearances are such as they would have been, had an etherial matter so existed and so acted. The observed laws of the phænomena are as extensive as those of the hypothesis; therefore it teaches us nothing but what we knew without it.

Indeed it appears to us useless, if not improper, to search for any mechanical cause of gravity. Let the language of Newton be recollected: "Whatever the cause is," says he, "that cause penetrates even to the centers of the sun and planets, without any diminution of its virtue; and it acteth not according to the superficies of bodies, (as mechanical causes do) but in proportion to the gravity of solid matter." If we admit the penetration of parts in impenetrable substance, we lose the notion of bodies: nay, we conceive and admit a contradiction. Let us also recollect that gravity is incessant in its operations; not the permanent effect of a transient, simultaneous impression. And since this is the case, and none scruple to acknowledge that gravity was imprinted upon all matter by the Creator's fiat, at the creation, why may it not be said that gravity is an indesinent effect of an immaterial cause. It would imply no contradiction; and what has been formerly said by an author of no small talents might be again urged in its favour: "We have then an effect worthy of omnipotence, and to be performed only by the immediate operation of the Deity. And from this we may see, with inexpressible satisfaction, the power of the Creator constantly exerted through all nature."

On this subject the reader will do well to consult an interesting essay on the hypotheses which have been invented to account for gravitation, by professor Vince, of Cambridge, an essay which has been published since the preceding article was prepared for the press.

GRAVITY, in music, is an affection of sound, whereby it becomes denominated grave, low, or flat.

Gravity stands in opposition to acuteness, which is that affection of sound, whereby it is denominated acute, sharp, or high. The gravity of sounds depends on the thickness and distension of the chords, or the length and diameter of the pipes, and in general on the mass, extent, and tension, of the sonorous bodies. The larger and more lax are the bodies, the slower will be the vibrations, and the graver the sounds.

It must be observed, that acuteness and gravity, as also loudness and lowness, are but relative things. We commonly call a sound acute and loud, in respect to another which is grave, or low with respect to the former; so that the same sound may be both grave and acute, and also loud and low, in different comparisons.

GRAVITY (Specific), is the relative, comparative, or apparent gravity of any body, in respect of that of an equal bulk or magnitude of another body; denoting that gravity or weight which is peculiar to each species or kind of body, and by which it is distinguished from all other kinds.

In this sense a body is said to be specifically heavier than another, when under the same bulk it contains a greater weight than that other; and reciprocally the latter is said to be specifically lighter than the former. Thus, if there are two equal spheres, each one foot in diameter; the one of lead, and the other of wood: since the leaden one is found heavier than the wooden one, it is said to be specifically, or in specie, heavier; and the wooden one specifically lighter.

This kind of gravity is by some called relative; in opposition to absolute gravity, which increases in proportion to the quantity or mass of the body.

Laws of the specific gravity of bodies.—I. If two bodies are equal in bulk, their specific gravities are to each other as their weight, or as their densities.

II. If two bodies are of the same specific gravity or density, their absolute weights will be as their magnitudes or bulks.

III. In bodies of the same weight, the specific gravities are reciprocally as their bulks.

IV. The specific gravities of all bodies are in a

ratio compounded of the direct ratio of their weights and reciprocal ratio of their magnitudes. And hence again the specific gravities are as the densities.

V. The absolute gravities or weights of bodies are in the compound ratio of their specific gravities and magnitudes or bulks.

VI. The magnitudes of bodies are directly as their weights, and reciprocally as their specific gravities.

VII. A body specifically heavier than a fluid, loses as much of its weight when immersed in it, as is equal to the weight of a quantity of the fluid of the same bulk or magnitude.

Hence, since the specific gravities are as the absolute gravities under the same bulk; the specific gravity of the fluid, will be to that of the body immerged, as the part of the weight lost by the solid, is to the whole weight.

And hence the specific gravities of fluids are as the weights lost by the same solid immerged in them.

VIII. *To find the specific gravity of a fluid or of a solid.*—On one arm of a balance suspend a globe of lead by a fine thread, and to the other fasten an equal weight, which may just balance it in the open air. Immerge the globe into the fluid, and observe what weight balances it then, and consequently what weight is lost, which is proportional to the specific gravity as above. And thus the proportion of the specific gravity of one fluid to another is determined by immersing the globe successively in all the fluids, and observing the weights lost in each, which will be the proportions of the specific gravities of the fluids sought.

This same operation determines also the specific gravity of the solid immerged, whether it is a globe, or of any other shape or bulk, supposing that of the fluid known. For the specific gravity of the fluid is to that of the solid, as the weight lost is to the whole weight.

Hence also may be found the specific gravity of a body that is lighter than the fluid, as follows.

IX. *To find the specific gravity of a solid that is lighter than the fluid, as water, in which it is put.* Annex to the lighter body another that is much heavier than the fluid, so that the compound mass may sink in the fluid. Weigh the heavier body and the compound mass separately, both in water and out of it; then find how much each loses in water, by subtracting its weight in water from its weight in air; and subtract the less of these remainders from the greater.

Then, as this last remainder,
Is to the weight of the light body in air,
So is the specific gravity of the fluid,
To the specific gravity of that body.

X. The specific gravities of bodies of equal weight, are reciprocally proportional to the quantities of weight lost in the same fluid. And hence is found the ratio of the specific gravities of solids, by weighing in the same fluid masses of them that weigh equally in air, and noting the weights lost by each.

The specific gravities of many kinds of bodies, both solid and fluid, have been determined by various authors. It will be sufficient here to give those of some of the most usual bodies that have been determined with the greater certainty. The numbers in this table express the number of avoirdupois ounces in a cubic foot of each body, that of common water being just 1000 ounces, or 62½lb.

A TABLE

OF THE SPECIFIC GRAVITIES OF DIFFERNT BODIES, ARRANGED ALPHABETICALLY.

Metals.

Antimony, crude	4064
glass of	4946
—— molten	6702
Arsenic, glass of, natural	3594
——— molten	5763
——— native orpiment	5452
Bismuth, molten	9823
——— native	9020
——— ore of, in plumes	4371
Brass, cast, not hammered	8396
——— ditto, wiredrawn	8544
——— cast common	7824
Cobalt, molten	7812
——— blue glass of	2441
Copper, not hammered	7788
——— the same wiredrawn	8878
——— ore of soft copper, or natural verdigr.	3572
Gold, pure, of 24 carats, melted, but not hammered	19258
—— the same hammered	19362
—— Parisian standard, 22 car. not hammered	17486
—— the same hammered	17589
—— guinea of Geo. II.	17150
—— guinea of Geo. III.	17629
—— Spanish gold coin	17655
—— Holland ducats	19352
—— trinket standard, 20 car. not hammered	15709
—— the same hammered	15775
Iron, cast	7207
—— bar, either hardened or not	7788
teel, neither tempered nor hardened	7833
—— hardened, but not tempered	7840
—— tempered and hardened	7818
—— ditto not hardened	7816
Iron, ore prismatic	7355
—— ditto specular	5218
—— ditto lenticular	5012
Lead, molten	11352
—— ore of, cubic	7587
—— ditto horned	6072
—— ore of black lead	6745
—— ditto white lead	4059
—— ditto ditto vitreous	6558
—— ditto red lead	6027
—— ditto saturnite	5925
Manganese, striated	4756
Molybdena	4738
Mercury, solid, or congealed	15632
——— fluent	13568
——— natural calx of	9230
——— precipitate per se	10871
——— precipitate, red	8399
——— brown cinnabar	10218
——— red cinnabar	6902
Nickel, molten	7807
——— ore of, called Kupfernickel of Saxe	6648
——— kupfernickel of Bohemia	6607
Platina, crude, in grains	15602
——— purified, not hammered	19500
——— purified, hammered	20337
——— ditto wiredrawn	21042
——— ditto rolled	22069
Silver, virgin, 12 deniers, fine not hammered	10744
——— ditto hammered	10511

Silver, Paris standard	10175
—— shilling of Geo. II.	10000
—— shilling of Geo. III.	10534
—— French coin	10408
Tin, pure Cornish, melted and not hardened	7291
—— the same hardened	7299
—— of Malacca, not hardened	7296
—— the same hardened	7307
—— ore of, red	6935
—— ore of, black	6901
—— ore of, white	6008
Tungsten	6066
Uranium	6440
Wolfram	7119
Zinc, molten	7191

Precious stones.

Beryl, or aqua-marine, oriental	3549
—— ditto occidental	2723
Chrysolite, of the jewellers	2782
—— of Brazil	2692
Chrystal, pure rock of Madagascar	2653
—— of Brazil	2653
—— European	2655
—— rose-coloured	2670
—— yellow	2654
—— violet, or amethyst	2654
—— white amethyst	2651
—— Carthaginian	2657
—— black	2654
Diamond, white oriental	3521
—— rose-coloured oriental	3531
—— orange ditto	3550
—— green ditto	3524
—— blue ditto	3525
—— Brazilian	3444
—— yellow	3519
Emerald of Peru	2775
Garnet of Bohemia	4189
—— of Syria	4000
—— dodecaedral	4063
—— volcanic, 24 faces	2468
Girasol	4000
Hyacinth, common	3687
Jargon of Ceylon	4416
Quartz, crystallised	2655
—— in the mass	2647
—— brown crystallised	2647
—— fragile	2640
—— milky	2652
—— fat or greasy	2646
Ruby, oriental	4283
· spinell	3760
· ballas	3646
· Brazilian	3531
Sapphire, oriental	3994
—— ditto white	3991
—— of Puys	4077
—— Brazilian	3131
Spar, white sparkling	2595
—— red ditto	2438
—— green ditto	2704
—— blue sparkling	2693
—— green and white ditto	3105
—— transparent ditto	2564
—— adamantine	3873
Topaz, oriental	4011
—— pistachio ditto	4061
—— Brazilian	3536
—— of Saxe	3564
Topaz, white ditto	3554
—— vermilion	4230

Silicious stones.

Agate, oriental	2590
—— onyx	2638
—— cloudy	2625
—— speckled	2607
—— veined	2667
—— stained	2632
Calcedony, common	2616
—— transparent	2664
—— veined	2606
—— reddish	2665
—— blueish	2587
—— onyx	2615
Carnelian, pale	2630
—— speckled	2612
—— veined	2623
—— onyx	2623
—— stalactite	2598
—— simple	2613
Flint, white	2594
—— black	2582
—— veined	2612
—— Egyptian	2565
Jade, white	2950
—— green	2966
—— olive	2983
Jasper, clear green	2539
—— brownish green	2681
—— red	2661
—— brown	2691
—— yellow	2710
—— violet	2711
—— cloudy	2735
—— veined	2696
—— onyx	2816
—— red and yellow	2750
—— bloody	2628
Opal	2114
Pearl, virgin oriental	2684
Pebble, onyx	2664
—— of Rennes	2654
—— English	2609
—— veined	2612
—— stained	2587
Prasium	2581
Sardonyx, pure	2603
—— pale	2606
—— speckled	2622
—— veined	2595
—— onyx	2595
—— blackish	2628
Schorl, black prism. hexaedral	3364
—— octaedral	3226
—— tourmalin of Ceylon	3054
—— antique basaltes	2923
—— Brazilian emerald	3156
—— cruciform	3286
Stone, paving	2416
—— cutler's	2111
—— grind	2143
—— mill	2500

Various stones, earths, &c.

Alabaster, oriental white	2730
—— ditto semitransparent	2762
—— yellow	2699
—— stained brown	2744
—— veined	2691
—— of Piedmont	2693
—— of Malta	2699
—— Spanish saline	2713
—— of Valencia	2638
—— of Malaga	2876

Amber, yellow transparent	1078
Ambergris	926
Amianthus, long	909
—— short	2313
Asbestos, ripe	2578
—— starry	3073
Basaltes from Giant's Causeway	2864
Bitumen, of Judea	1104
Brick	2000
Chalk, Spanish	2790
—— coarse Briançon	2727
—— British	2784
Gypsum, opaque	2168
—— semitransparent	2306
—— fine ditto	2274
—— rhomboidal	2311
—— ditto 10 faces	2312
—— cuneiform crystallised	2306
Glass, green	2642
—— white	2892
—— bottle	2733
—— Leith crystal	3189
—— fluid	3329
Granite, red Egyptian	2654
—— of Balbeck	3500
Hone, white razor	2876
Lapis nephriticus	2894
—— lazuli	3054
—— hæmatites	4360
—— calaminaris	5000
—— Judaicus	2500
—— manati	2270
Limestone	3179
—— white flour	3156
—— green	3182
Marble, green campanian	2742
—— red	2724
—— white Cassara	2717
—— white Parian	2838
—— Pyrenean	2726
—— black Biscayan	2695
—— Brocatelle	2650
—— Castilian	2700
—— Valencian	2710
—— white Grenadan	2705
—— Siennien	2678
—— Roman violet	2755
—— African	2708
—— violet Italian	2858
—— Norwegian	2728
—— Siberian	2718
—— green Egyptian	2668
—— Swisserland	2714
—— French	2649
Obsidian stone	2348
Peat, hard	1329
Phosphorus	1714
Porcelaine, Seves	2146
—— Limoges	2341
—— China	2385
Porphyry, red	2765
—— green	2676
—— red, from Dauphiny	2793
—— red, from Cordone	2754
—— green, from ditto	2728
Pyrites, coppery	4954
—— ferruginous cubic	3900
—— ditto round	4101
—— ditto of St. Domingo	3440
Serpentine, opaque, green Italian	2430
—— ditto, veined black and olive	2594
—— ditto, red and black	2627
—— semitranspar. grained	2586
—— ditto fibrous	3000
Serpentine, semitranspar. from Dauphiny	2669
Slate, common	2672
—— new	2854
—— black stone	2186
—— fresh polished	2766
Stalactite, transparent	2314
—— opake	2478
Stone, pumice	915
—— prismatic basaltes	2722
—— touch	2415
—— Siberian blue	2945
—— oriental ditto	2771
—— common	2520
—— Bristol	2510
—— Burford	2049
—— Portland	2496
—— rag	2470
—— rotten	1981
—— hard paving	2460
—— mill	2500
—— clicard, from Brachet	2357
—— ditto, from Ouchain	2274
—— Notre Dame	2378
—— St. Maur	2034
—— St. Cloud	2201
Sulphur, native	2033
—— molten	1991
Talc, of Muscovy	2792
—— black crayon	2089
—— ditto German	2246
—— yellow	2655
—— black	2900
—— white	2704

Liquors, oils, &c.

Acid, sulphuric	1841
—— ditto, highly concentrated	2125
—— nitric	1271
—— ditto, highly concentrated	1580
—— muriatic	1194
—— red acetous	1025
—— white acetous	1014
—— distilled ditto	1010
—— fluoric	1500
—— acetic	1063
—— phosphoric	1558
—— formic	994
Alcohol, commercial	837
—— highly rectified	829
Alcohol, mixed with water,	
15-16ths alcohol	853
14-16ths ditto	867
13-16ths ditto	882
12-16ths ditto	895
11-16ths ditto	908
10-16ths ditto	920
9-16ths ditto	932
8-16ths ditto	943
7-16ths ditto	952
6-16ths ditto	960
5-16ths ditto	967
4-16ths ditto	973
3-16ths ditto	979
2-16ths ditto	985
1-16th ditto	997
Ammoniac, liquid	897
Beer, pale	1024
—— brown	1038
Cyder	1018
Ether, sulphuric	739
—— nitric	909
—— muriatic	730
—— acetic	860
Milk, woman's	1020

Milk, cow's	1032
—— ass's	1036
—— ewe's	1041
—— goat's	1035
—— mare's	1034
—— cow's clarified	1019
Oil, essential, of turpentine	870
—— essential, of lavender	894
—— ditto, of cloves	1036
—— ditto, of cinnamon	1044
—— of olives	915
—— of sweet almonds	917
—— of filberts	916
—— linseed	940
—— of walnuts	923
—— of whale	923
—— of hempseed	926
—— of poppies	924
—— rapeseed	919
Spirit of wine. See Alcohol.	
Turpentine, liquid	991
Urine, human	1011
Water, rain	1000
——— distilled	1000
——— sea (average)	1026
——— of Dead Sea	1240
Wine, Burgundy	992
—— Bourdeaux	994
—— Madeira	1038
—— Port	997
—— Canary	1033

Resins, gums, and animal substances, &c.

Aloes, socotrine	1380
——— hepatic	1359
Assafetida	1328
Bees'-wax, yellow	965
——— white	969
Bone of an ox	1656
Butter	942
Calculus humanus	1700
——— ditto	1240
——— ditto	1434
Camphor	989
Copal, opake	1140
——— Madagascar	1060
——— Chinese	1063
Crassamentum, human blood	1126
Dragon's blood	1205
Elemi	1018
Fat, beef	923
—— hog's	937
—— mutton	924
—— veal	934
Galbanum	1212
Gamboge	1222
Gum, ammoniac	1207
—— Arabic	1452
—— euphorbia	1124
—— seraphic	1201
—— tragacanth	1316
—— bdellium	1372
—— scammony of Smyrna	1274
—— ditto of Aleppo	1235
Gunpowder, shaken	932
——— in a loose heap	836
——— solid	1745
Honey	1450
Indigo	769
Ivory	1826
Juice of liquorice	1723
—— of acacia	1515
Labdanum	1186
Lard	948
Mastic	1074
Myrrh	1360
Opium	1336
Scammony. See Gum.	
Serum of human blood	1030
Spermaceti	943
Storax	1110
Tallow	942
Terra Japonica	1398
Tragacanth. See Gum.	
Wax. See Bees'-wax.	
——, shoemaker's	897

Woods.

Alder	800
Apple-tree	793
Ash, the trunk	845
Bay-tree	822
Beech	852
Box, French	912
—— Dutch	1328
—— Brazilian red	1031
Campechy wood	913
Cedar, wild	596
——— Palestine	613
——— Indian	1315
——— American	561
Citron	726
Coco-wood	1040
Cherry-tree	715
Cork	240
Cypress, Spanish	644
Ebony, American	1331
——— Indian	1209
Elder-tree	695
Elm, trunk of	671
Filbert-tree	600
Fir, male	550
—— female	498
Hazel	600
Jasmin, Spanish	770
Juniper-tree	556
Lemon-tree	703
Lignum vitæ	1333
Linden-tree	604
Logwood. See Campechy.	
Mastich-tree	849
Mahogany	1063
Maple	750
Medlar	944
Mulberry, Spanish	897
Oak, heart of, 60 years old	1170
Olive-tree	927
Orange-tree	705
Pear-tree	661
Pomegranate-tree	1354
Poplar	383
———, white, Spanish	529
Plum-tree	785
Quince-tree	705
Sassafras	482
Vine	1327
Walnut	671
Willow	585
Yew, Dutch	788
—— Spanish	807

Weight and specific gravities of different gases.

Fahrenheit's therm. 55°	Spec. grav.	Barom. 30 inch. Wt. cub. foot.
Atmospheric air	1.2	525.0 grs.
Hydrogenous gas	0.1	43.75
Oxygenous gas	1.435	627.812

Azotic gas	1.182	517.123
Nitrous gas	1.4544	636.333
Ammoniac. gas	.7311	319.832
Sulphur. acid gas.	2.7611	1207.978

In this table the weight and specific gravities of the principal gases are given, as they correspond to a state of the barometer and thermometer which may be chosen for a medium. The specific gravity of any one gas to that of another will not conform to exactly the same ratio under different degrees of heat and other pressures of the atmosphere, because the various expansions by no means follow the same law.

These numbers being the weight of a cubic foot, or 1728 cubic inches, of each of the bodies, in avoirdupois ounces, by proportion the quantity in any other weight, or the weight of any other quantity, may be readily known.

For example. Required the content of an irregular block of millstone which weighs 1 cwt. or 112lb. or 1792 ounces. Here, as 2500 : 1792 : : 1728 : 1228⅗ cubic inches the content.

Ex. 2. To find the weight of a block of granite, whose length is 63 feet, and breadth and thickness each 12 feet; being the dimensions of one of the stones of granite in the walls of Balbec. Here $63 \times 12 \times 12 = 9072$ feet is the content of the stone; therefore as 1 : 9072 : : 3500 oz. 31752000 oz. or 885 tons 18 cwt. 3 qrs. the weight of the stone.

XI. A body descends in a fluid specifically lighter, or ascends in a fluid specifically heavier, with a force equal to the difference between its weight and that of an equal bulk of the fluid.

XII. A body sinks in a fluid specifically heavier, so far as that the weight of the body is equal to the weight of a quantity of the fluid of the same bulk as the part immersed. Hence, as the specific gravity of the fluid, is to that of the body, so is the whole magnitude of the body, to the magnitude of the part immersed.

XIII. The specific gravities of equal solids are as their parts immerged in the fluid.

The several theorems here delivered are both demonstrable from the principles of mechanics, and are also equally conformable to experiment, which answers exactly to the calculation. See Hydrostatics.

GRA'VY. *s.* The serous juice that runs from flesh not much dried by the fire (*Arbuthnot*).

GRAY. *a.* (ᵹꞃæᵹ, Saxon; *grau*, Danish.) 1. White with a mixture of black (*Newton*). 2. White or hoary with old age (*Walton*). 3. Dark like the opening or close of day; of the colour of ashes (*Gay*).

Gray (Thomas), an eminent English poet, was the son of a reputable citizen, and born in Cornhill in 1716. He received his education at Eton school, and the university of Cambridge. He was originally intended for the law; but had not sufficient fortune to enable him to pursue the study. After making the tour of France and Italy with Mr. Horace Walpole, he resided chiefly at the university of Cambridge, where he was appointed professor of modern history. He died of the gout in 1771. He was profound in his erudition; and his genius was of the highest order; though his poems are but few. He has been often called, we think not improperly, the English Pindar. An edition of his poems, with memoirs of his life and writings, was published in 1775, by Mr. Mason. This gentleman, however, instead of employing his own pen in drawing Mr. Gray's character, has adopted one drawn by the Rev. Mr. Temple, rector of Mamhead in Devonshire, in a letter to Mr. Boswell; to whom the public are indebted for communicating it. "Perhaps (says Mr. Temple) he was the most learned man in Europe. He was equally acquainted with the elegant and profound parts of science, and that not superficially but thoroughly. He knew every branch of history, both natural and civil; had read all the original historians of England, France, and Italy: and was a great antiquarian. Criticism, metaphysics, morals, politics, made a principal part of his plan of study; voyages and travels of all sorts were his favourite amusement; and he had a fine taste in painting, prints, architecture, and gardening. With such a fund of knowledge, his conversation must have been equally instructing and entertaining; but he was also a good man, a well-bred man, a man of virtue and humanity. There is no character without some speck, some imperfection; and I think the greatest defect in his was an affectation of delicacy, or rather effeminacy, and a visible fastidiousness, or contempt and disdain of his inferiors in science. He also had, in some degree, that weakness which disgusted Voltaire so much in Mr. Congreve: though he seemed to value others chiefly according to the progress they had made in knowledge, yet he could not bear to be considered himself merely as a man of letters; and though without birth, or fortune, or station, his desire was to be looked upon as a private independent gentleman, who read for his amusement. Perhaps it may be said, What signifies so much knowledge, when it produces so little? Is it worth taking so much pains to leave no memorial but a few poems? But let it be considered, that Mr. Gray was, to others, at least innocently employed; to himself, certainly beneficially. His time passed agreeably; he was every day making some new acquisition in science; his mind was enlarged, his heart softened, and his virtue strengthened; the world and mankind were shown to him without a mask; and he was taught to consider every thing as trifling, and unworthy the attention of a wise man, except the pursuit of knowledge, and the practice of virtue in that state wherein God hath placed us."

GRAY, a town of France, in the department of Upper Saone. Its trade is in iron. Lat. 47. 28 N. Lon. 5. 41 E.

Gray's Thurrock, a town in Essex, with a market on Thursdays. Lat. 51. 26 N. Lon. 0. 24 E.

Gray. *s.* A badger (*Ainsworth*).

GRA'YBEARD. *s.* (*gray* and *beard.*) An old man (*Shakspeare*).

GRAYLING, in ichthyology, a species of Salmo (which see), as to its zoological arrangement and specific character. In this country it is often fished for. Its haunts are

nearly the same as those of the trout; and in fishing for either of them you may catch both. They spawn the beginning of April, when they lie mostly in sharp streams; in December the grayling is in his prime, at which time his head and gills are blackish, and his belly dark grey, studded with black spots. He bites very freely, but is often lost when struck, his mouth being very tender. Angle for him about mid-water, he being much more apt to rise than descend; and when you angle for him alone and not for the trout also, use a quill-float, with the bait about six or seven inches from the ground. He takes brandlings, gilt-tails, meadow-worms, gentles, &c. but the most excellent bait for him in March or April is the tag-tail.

The grayling is found in great plenty in many rivers in the north, particularly the Humber, and in the Wye, which runs through Herefordshire and Monmouthshire into the Severn.

GRA'YNESS. *s.* (from *gray.*) The quality of being gray.

To GRAZE. *v. n.* (from *grass.*) 1. To eat grass; to feed on grass (*Shakspeare*). 2. To supply with grass (*Bacon*). 3. To move on devouring (*Bacon*). 4. (from *raser*, Fr.) To touch lightly (*Bacon*).

To GRAZE. *v. a.* 1. To tend grazing cattle (*Daniel*). 2. To feed upon (*Milton*). 3. To supply with grass (*Swift*).

GRA'ZER. *s.* (from *graze.*) One that feeds on grass (*Philips*).

GRA'ZIER. *s.* (from *graze.*) One who feeds cattle (*Howel*).

GREASE. *s.* (*graisse*, French.) The soft part of the fat (*Shakspeare*).

GREASE, an inflammation and swelling of the heels of horses, sometimes confined to the neighbourhood of the fetlocks, at other times spreading considerably farther up the legs, and secreting an oily matter, to which the disease is properly indebted for its name. The discharge has a particular odour, owing, we imagine, to the secretion of the heels being of a nature peculiar to them, as in the instance of the axilla of the human subject. Horses of the heavy class, with round fleshy legs, are the most liable to grease, and the white legged more than the rest. The disease is almost exclusively found in the posterior extremities.

Grease is brought on by sudden changes from a cold to a hot temperature: such as removing horses from grass into hot stables; from hastily substituting a generous for an impoverishing diet; from the negligence of grooms, in leaving the heels wet and full of sand; and from constitutional debility. The reason which has been assigned for the hind-leg of the horse being particularly the seat of this complaint is, the distance being greatest between that and the heart, in consequence of which the blood's circulation is weakest in these parts, and the pressure of its column overcome with the greatest difficulty by the vessels.

On the approach of this disease, and for several days previously to any striking appearances of swelling and inflammation, considerable pain seems to be experienced by the animal in the affected heel, as he is continually raising it from the ground, and cannot rest upon it without much uneasiness.

The inflammation and enlargement increase, and a great multitude of little exulcerations follow, throwing forth a perpetual discharge of fetid sanies. To these follow, from the irritating nature of the discharge, a great number of warty excrescences, vesicles filled with an acrimonious fluid and cadaverous ulcerations, the caustic sanies from which hangs in the hair as it flows, producing a chain of fresh ulcers, or corrodes and destroys the hair altogether, still adhering to the superincumbent cuticle.

A horse, in such a state, should be separated from others, lest a miasm so excessively noxious should lay the foundation of this or some other disease among horses perfectly sound.

In the incipient state of the disease, the inflammation may be often removed with ease by linseed poultices and purgatives. If ulceration ensue, to remove the inflammation the poultices should still be applied, and the ulcers washed clean and dressed with digestive ointment: when the inflammation has subsided, solutions of alum or borax should be applied liberally, and the horse ridden frequently into the sea, or turned into salt marshes. If the disease, by neglect, become altogether constitutional, it is not easy to exterminate it; and the death of the animal will be generally found the cheapest remedy.

To GREASE. *v. a.* (from the noun.) 1. To smear or anoint with grease. 2. To bribe; to corrupt with presents (*Dryden*).

GRE'ASINESS. *s.* (from *grease.*) Oiliness; fatness (*Boyle*).

GRE'ASY. *a.* (from *grease.*) 1. Oily; fat; unctuous (*Shakspeare*). 2. Smeared with grease (*Mortimer*). 3. Fat of body; bulky (*Shakspeare*).

GREAT. *a.* (ȝꞃeat, Saxon.) 1. Large in bulk or number (*Locke*). 2. Having any quality in a high degree (*Tillotson*). 3. Considerable in extent or duration (*Sam.*). 4. Important; weighty (*Shakspeare*). 5. Chief; principal (*Shakspeare*). 6. Of high rank; of large power (*Pope*). 7. Illustrious; eminent; noble (*Jeremiah*). 8. Grand of aspect; of elevated mien (*Dryden*). 9. Magnanimous; generous (*Sidney*). 10. Swelling; proud (*Knolles*). 11. Familiar; much acquainted (*Bacon*). 12. Pregnant; teeming (*May*). 13. It is added in every step of ascending or descending consanguinity: as, *great* grandson is the son of my grandson (*Addison*). 14. Hard; difficult; grievous (*Taylor*).

GREAT. *s.* (from the adjective.) The whole; the gross; the whole in a lump (*Raleigh*).

GRE'ATBELLIED. *a.* (*great* and *belly.*) Pregnant; teeming (*Wilkins*).

To GRE'ATEN. *v. a.* (from *great.*) To aggrandize; to enlarge (*Raleigh*).

GREATHEA'RTED. *a.* (*great* and *heart.*) High-spirited; undejected (*Clarendon*).

GRE'ATLY. *ad.* (from *great.*) 1. In a great degree (*Milton*). 2. Nobly; illustriously (*Dryden*). 3. Magnanimously; generously; bravely (*Addison*).

GRE'ATNESS. *s.* (from *great.*) 1. Largeness of quantity or number. 2. Comparative quantity (*Locke*). 3. High degree of any quality (*Rogers*). 4. High place; dignity; power; influence; empire (*Swift*). 5. Swelling pride; affected state (*Bacon*). 6. Merit; magnanimity; nobleness of mind (*Milton*). 7. Grandeur; state; magnificence (*Pope*).

GREAVE. *s.* (ʒnæf, Saxon.) A grove (*Spenser*).

GREAVES. *s.* (from *grêves*, French.) Armour for the legs; a sort of boots (*Samuel*).

Greaves (John), a celebrated mathematician and antiquary, was born at Colmore in Hampshire, in 1602; and educated at Oxford. After visiting several parts of the continent he went first to Constantinople and afterwards to Egypt, and returned home through Italy, stored with manuscripts, gems, coins, and other antiquities. After his return he was made professor of astronomer at Oxford; but he was obliged to resign the professorship by the persecution of the parliamentary visitors. He died in 1652. He was the author of several learned works.

GREBE, in ornithology. See Colymbus.

GRE'CISM. *s.* (*græcismus*, Latin.) An idiom of the Greek language.

GREE. *s.* Good-will; favour (*Spenser*).

GREECE. *s.* (corrupted from *degrees.*) A flight of steps: obsolete (*Shakspeare*).

Greece, the present Rumelia, and in many respects one of the most deservedly celebrated countries in the world, was anciently bounded on the north by Macedonia and the river Strymon; on the west by the Ionian sea; on the south by the Mediterranean, on the east by the Ægean Sea, and Archipelago. It extended from the Strymon, by which it was parted from Thrace, to the promontory of Tenarus, the southmost point of the Peloponnesus, now the Morea, nearly 440 English miles, and in breadth from east to west about 359 miles.

The general names by which the inhabitants of this country were known to the ancients were those of Graioi, or Graicoi, from whence the name of Greece is plainly derived. These names are thought to come from Græcus, the father, or (according to some) the son, of Thessalus, who gave name to Thessaly; but some modern critics choose to derive it from Ragau, the same with Reu, the son of Peleg, by the transposition of a letter to soften the sound. These names were afterwards changed for Achæi and Hellenes; the first, as is supposed, from Achæus, the son of Xuthus, the son of Hellen, and father of Ion; or, according to the fable, the son of Jupiter: the other from Hellen above-mentioned, the son of Deucalion, and father of Dorus, from whom came the Dores, afterwards a famous nation among the Greeks. Another name by which the Greeks were known in some parts of the country was that of Pelasgi, which the Arcadians, the most ancient people in Greece, deduced from their pretended founder Pelasgus; who is said to have got such footing in Peloponnesus, that the whole peninsula from him was called Pelasgia. But the most ancient name of all is universally allowed to have been that of Iones, which the Greeks themselves derived from Ion above; or, as the fable hath it, the son of Apollo, by Creusa, the daughter of Erichtheus. Josephus, however, affirms that their original is of much older date, and that Javan, the son of Japhat, and grandson of Noah, was the first who peopled these countries. It is true, indeed, that among the Greeks themselves, only the Athenians, and such colonies as sprung from them, were called Iones: but it is also plain, beyond exception, that other nations gave this name to all the inhabitants.

We cannot attempt within the bounds of this article to give even a sketch of the Grecian history and manners; we must therefore refer to the standard authors upon these subjects, Gillies, Goldsmith, Mitford, Potter, De Pauw, &c. We merely remark that after their conquest by the Romans they made no united effort to recover their liberty. They continued in quiet subjection till the beginning of the 15th century. About that time they began to suffer under the tyranny of the Turks, and their sufferings were completed by the taking of Constantinople in 1453. Since that time, they have groaned under the yoke of a most despotic government; so that all traces of their former valour, ingenuity, and learning, are now in a manner totally extinct.

Modern Greece comprehends Macedonia; Albania, now called Arnaut; Epirus; Thessaly, now Jana; Achaia, now Livadia; the Peloponnesus, now Morea; together with the islands on its coast, and in the Archipelago. The continent of Greece is seated betwixt the 36th and 43d degrees of north latitude; and between the 19th and 27th degrees of longitude, east of London. To the north it is bounded by Bulgaria and Servia, from which it is divided by a ridge of mountains; to the south by the Mediterranean sea; to the east by Romania and the Archipelago, and to the west by the Adriatic, or gulf of Venice. Its length is said to be about 400 miles, and its utmost breadth about 350 miles. The air is extremely temperate and healthy; and the soil fruitful, though badly cultivated, yielding corn, wine, delicious fruits, and abounding with cattle, fowls, and venison. As to religion, Christianity was planted in Greece soon after the death of our Saviour, and flourished there for many ages in great purity; but since the Greeks became subject to the Turkish yoke, they have sunk into the most deplorable ignorance, in consequence of the slavery and thraldom under which they groan, and their religion is now greatly corrupted. See Greek church.

As to the character of the modern Greeks, they are said to be very covetous, hypocritical, treacherous, great pedcrasts, and at the same time revengeful to the highest degree, but very

superstitious. The Turks are remarkable for their taciturnity; they never use any unnecessary words: but the Greeks, on the contrary, are very talkative and lively. The Turks generally practise what their religion enjoins, but the Greeks do not; and their misery puts them upon a thousand mean shifts and scandalous practices, authorized by bad example, and perpetuated from father to son. The Greek women have fine features and beautiful complexions: their countenances still very much resemble those of the ancient Greek statues.

GRE'EDILY. *ad.* (from *greedy.*) Eagerly; ravenously; voraciously (*Denham*).

GRE'EDINESS. *s.* (from *greedy.*) Ravenousness; voracity; hunger; eagerness of appetite or desire (*Denham*).

GRE'EDY. *a.* (ʒɲæðıʒ, Saxon.) 1. Ravenous; voracious; hungry (*King Charles*). 2. Eager; vehemently desirous (*Fairfax*).

GREEK, or GRECIAN, any thing belonging to ancient Greece. The Greek language, as preserved in the writings of the celebrated authors of antiquity, as Homer, Hesiod, Demosthenes, Aristotle, Plato, Xenophon, &c. has a great variety of terms and expressions, suitable to the genius and occasions of a polite and learned people, who had a taste for arts and sciences. In it, proper names are significative; which is the reason that the modern languages borrow so many terms from it. When any new invention, instrument, machine, or the like, is discovered, recourse is generally had to the Greek for a name to it; the facility wherewith words are there compounded, affording such as will be expressive of its use: such are, barometer, hygrometer, microscope, telescope, thermometer, &c. But of all sciences, medicine most abounds with such terms; as diaphoretic, diagnosis, diarrhœa, hæmorrhage, hydrophobia, phthisis, atrophy, &c. Besides the copiousness and significancy of the Greek, wherein it excels most, if not all, the other languages, it has also three numbers, viz. a singular, dual, and plural: also abundance of tenses in its verbs, which makes a variety in discourse, prevents a certain dryness that always accompanies too great an uniformity, and renders that language peculiarly proper for all kinds of verse. The use of the participles, of the aorist and preterite, together with the compound words already mentioned, give it a peculiar force and brevity, without taking any thing from its perspicuity.

It is no easy matter to assign the precise difference between the modern and ancient Greek; which consists in the terminations of the nouns, pronouns, verbs, &c. not unlike what obtains between some of the dialects of the Italian or Spanish. There are also in the modern Greek many new words, not to be met with in the ancient. We may distinguish three ages of the Greek tongue: the first of these ends at the time when Constantinople became the capital of the Roman empire; the second lasted from that period to the taking of Constantinople by the Turks; and the third from that time to the present. For a curious dissertation on this language, with a fac-simile of a letter written by a modern Grecian, see vol. vii. of the Transactions of the Royal Irish Academy.

GREEK CHURCH, that part of the Christian church which was first established in Greece, and is now spread over a larger extent of country than any other established church. It comprehends in its bosom a considerable part of Greece, the Grecian isles, Wallachia, Moldavia, Egypt, Abyssinia, Nubia, Lybia, Arabia, Mesopotamia, Syria, Cilicia, and Palestine, which are all under the jurisdiction of the patriarchs of Constantinople, Alexandria, Antioch, and Jerusalem. If to these we add the whole of the Russian empire in Europe, great part of Siberia in Asia, Astracan, Casan, and Georgia—it will be evident that the Greek church has a wider extent of territory than the Latin, with all the branches which have sprung from it; and that it is with great impropriety that the church of Rome is called by her members the catholic or universal church. That in these widely distant countries the professors of Christianity are agreed in every minute article of belief, it would be rash to assert; but there is certainly such an agreement among them with respect both to faith and to discipline, that they mutually hold communion with each other, and are in fact but one church.

As the Greek church has no public or established articles, like those of the churches of England and Scotland, we can collect what is its doctrine only from its creeds, from the councils whose decrees it receives, from the different offices in its liturgies, and from the catechisms which it authorises to be taught. "The doctrine of the Trinity, and the articles of the Nicene and Athanasian creeds, are received by the Greeks in common with other Christians. In one particular, indeed, they differ from the other churches of Europe, whether Romish or reformed. They believe, that the Holy Spirit proceeds from the Father only, and not from the Father and the Son; and in defence of this opinion they appeal to ecclesiastical history, the acts of councils, the writings of the fathers, ancient manuscripts, and especially to a copy of the creed of Constantinople, engraven on two tables of silver, and hung up in the church of St. Peter at Rome, by order of Leo III. Of the Nicene or Constantinopolitan creed, therefore, as it is received by them, the eighth article runs in these words; 'I believe in the Holy Ghost, the Lord and Giver of life, who proceedeth from the Father, and with the Father and the Son together is worshipped and glorified:' and the corresponding article of the Athanasian creed is of course, 'The Holy Ghost is of the Father, neither made, nor created, nor begotten, but proceeding.'"

Though the bishops and clergy of the Greek church abhor the use of images, which they pretend to be one cause of their separation from the see of Rome, they admit into their churches the pictures of saints, to instruct, they say, the ignorant, and to animate the devotion of others. This practice they consider as by no means contrary to the second commandment of the decalogue, which, according to them, prohibits only the worshipping of such idols as the Gentiles believed to be gods; whereas their pictures, being used merely as remembrancers of Christ and the saints, have written on each of them the name of the person whom it is meant to represent. Dr. King

assures us that the more learned of the Russian clergy would willingly allow no representation whatever of God the Father; and that, during the reign of Peter the Great, the synod not only censured the use of such pictures in churches, but petitioned the emperor that they might be every where taken down. Peter, however, though he fully concurred in opinion with the synod, thought this a measure for which the minds of his subjects were not ripe, and dreaded, that if carried into execution it would occasion a general insurrection. Such pictures, therefore, though not less impious than absurd, are still in use.

In the Greek as well as in the Roman church, the invocation of saints is practised, but they are not invoked in either as deities, but merely as intercessors with the Supreme God, "it being more modest (say the Greeks), as well as more available, to apply to them to intercede with God, than to address ourselves immediately to the Almighty." Plausible as this reasoning may at first sight appear, it ascribes to the saints the divine attribute of ubiquity, and is likewise in direct contradiction to the doctrine of St. Paul, who hath taught us, that as "there is one God, so there is but one mediator between God and man, the man Christ Jesus."

The Greek church, at the celebration of the Lord's Supper, commemorates the faithful departed, and even prays for the remission of their sins; but she allows not of purgatory, nor pretends to determine dogmatically concerning the state or condition of departed souls. She must, however, believe that no final judgment is passed upon the great body of mankind till the consummation of all things, otherwise such prayers could not be offered without absurdity. The editors of the Encyclopædia Britannica assert, that in this part of her doctrine, the Greek church is countenanced by all the writers of the primitive church; and they adduce some passages of Scripture, (as Matt. xxv. 19 20. 31. 34. 2 Tim. i. 18. iv. 8.) which they think countenance the same doctrine; but every candid reader will see that the application of these passages to the point in hand is very far from obvious and natural. These learned gentlemen say, "The practice of praying for the dead is loudly condemned in every protestant country, and yet there is no Christian who does not in effect pray for his departed friends." They support this assertion by arguments for the confutation of which, they say in another place, they are under no apprehension. "This (say they), may appear a paradox, but it is an obvious and a certain truth; for where is the man who believes in a general judgment, and does not wish that his deceased wife, or parent, or child, or friend, 'may find mercy of the Lord in that day?' Such a wish is the essence of a prayer; which consists not of the sounds in which our sentiments are clothed, but in the aspirations of a devout heart." We are ever ready to give our suffrage in favour of the excellent work from which this passage is extracted, and in general we pay great deference to the opinion of its learned conductors: but in the present instance, we see little force in their arguments; and, as their authority may persuade, where their reasonings do not convince; we beg, in a point of such importance to protestants as that before us, to state concisely our reasons for rejecting the opinion of these gentlemen. We do not deny that a devout wish is of the essence of a prayer; but we conceive it is not all that is essential. Where, we would say, is the good and benevolent man, who sympathizes with the distresses of his fellow creatures, who, on witnessing the execution of a young man that had been seduced into vicious and criminal conduct by base and ensnaring company, does not wish that this youth had been proof against the enticements of vice, and so lived as to have ended his days in peace? But this wish is widely different from the prayer of the Christian: it produces no change in the state of the unhappy youth, it availeth not in arresting the approach of death; while the "fervent prayer of a righteous man availeth much." Unless prayer be accompanied with a humble expectation that it will be heard and answered, that it will prevail with the Father of our spirits (as we are assured it always will if we pray in faith for spiritual blessings to descend upon ourselves), it loses its life's blood, if we may so speak, and degenerates into a mere "form of godliness without the power." We believe, in opposition to the opinion in the Encyclopædia Britannica, that few, very few, Christians pray for their departed friends. Dr. Johnson, with the caution natural to that great man, after the death of his wife writes thus in his journal: "In the evening I prayed for her conditionally, if it were lawful." But in general, we conceive, the good man is not vainly hoping for any change in the final state of his departed friend, in consequence of his prayers, but fervently wishing, that, previous to his death he might, though unknown to the survivors, have reconciled himself unto God, and so have died under the hopes of the gospel. But we must return from this digression; the importance of the subject discussed will, we trust, plead our excuse.

Supererogation with its consequent indulgencies and dispensations, which were once so profitable, and afterwards so fatal to the interests of the court of Rome, are utterly disallowed in the Greek church, which likewise lays no claim to the character of infallibility. She is indeed, like some other churches, very inconsistent on this last topic; for whilst she pretends not to an absolute exemption from error, her clergy seem to consider their own particular mode of worship as that which alone is acceptable to God.

Predestination is a dogma of the Greek church, and a very prevailing opinion amongst the people of Russia; "and I must do the justice (says Dr. King) to those who have written upon it, especially the latest authors of that country, to say that they have treated it, as depending on the attribute of prescience in the divine nature, with a much better kind of logic than that with which such points are generally discussed."

In the Greek church there are seven sacraments; or, as they are termed, mysteries, viz. baptism; the chrism, or baptismal unction; the eucharist; confession; ordination; marriage; and the mystery of the holy oil, or euchelaion. By the Greeks a mystery is defined to be "a ceremony or act appointed by God, in which God giveth or signifieth his grace; and of the seven which they celebrate, four are to be received by all Christians, viz. baptism, the baptismal unction, the eucharist, confession. Of these, baptism and the eucharist are deemed the chief; and of the other three, none, not even the euchelaion, is considered as obligatory upon all.

With respect to baptism, we know not that they hold any peculiar opinions. They consider it indeed as so absolutely necessary to salvation,

that in cases of extremity, when a priest or deacon cannot be had, it may be administered by a midwife or any other person, and is not to be repeated on any occasion whatever. In this opinion, as well as in the practice founded on it, they are in perfect harmony with the church of Rome, which, as every person knows, has for many ages allowed the validity of lay baptism in cases of necessity.

The daily service of the Greek church is so long and complicated, that it is impossible to give an adequate account of it without swelling this article far beyond its due proportion. Of this the reader will be convinced, when he is informed that the several books containing the church service for all the days in the year amount to more than twenty volumes in folio, besides one large volume called the Regulation, which contains the directions how the rest are to be used.

The four gospels make one volume by themselves; and whenever the gospel is read in any service, the deacon exclaims; "Wisdom, stand up. Let us hear the holy gospel." The priest then saith, "The lesson from the gospel according to St. Matthew, St. Mark, &c." The deacon says again, "Let us stand." The choir, at the beginning and end of the gospel, always says, "Glory be to thee, O Lord, glory be to thee." From the old testament and the epistles extracts only are used in the service; and when they are to be read, the deacon calls out, "Attend."

The service of this church as it now stands, and was at first drawn up in writing, is calculated for the use of monasteries; and when it was afterwards applied to parochial churches, many of the offices or forms, which were composed for different hours of the day and night, were used as one service, without the slightest alteration being made to avoid repetitions. Something of this kind has taken place in the church of England, where the matins, the litany, and the communion, which were formerly three distinct services, read at different times of the day, are now run into one service; which by those not accustomed to it is therefore deemed long, as well as deformed by needless repetitions.

The service of every day, whether it has a vigil or not, begins in the evening of what we would call the preceding day, as among the Jews; and for the same reason, because it is said in the Mosaic account of the creation, that "the evening and the morning were the first day." The several services, according to the original or monkish institution, are, 1. The vespers, which used to be celebrated a little before sun-set; 2. The after-vespers, answering to the completorium of the Latin church, which used to be celebrated after the monks had supped, and before they went to bed; 3. The mesonyecticon, or midnight service; 4. The matins at break of day, answering to the laudes of the Romish church; 5. The first hour of prayer, or prima, at sun-rise; 6. The third hour, or tertia, at the third hour of the day; 7. The sixth hour, or sexta, at noon; 8. The ninth hour, or nona, in the afternoon at the ninth hour of the day. These are called the canonical hours; but it is to be observed, that the after-vespers were not added till a late period, before which the reason assigned for the number of services being seven, was, that David saith, "Seven times a day will I praise thee." When all the psalms and hymns were sung, these daily services could not possibly have been performed in less than twelve or fourteen hours. In the church of Russia, and probably in other branches of the Greek church, there are at present but three services in the day: the ninth hour, the vespers, and the after-vespers making one; the mesonyecticon, the matins, and prima, another; and the third and sixth hour, with the communion, the last. In all the services, except the communion, prayers and praises are offered to some saint, and to the Virgin Mary, almost as often as to God; and in some of the services, after every short prayer uttered by the deacon or the priest, the choir chants "Lord have mercy upon us," thirty, forty, or fifty times successively.

Though the number of services is the same every day, the services themselves are constantly varying in some particular or other, as there is not a day which, in the Greek church, is not either a fast or a festival. For these days there are particular hymns and services, in two volumes folio, to which there is a supplement containing services for the saints and festivals, as they occur in the calendar throughout the year. These services are adjusted by the directions contained in the Book of Regulation; but the adjustment is very difficult and intricate.

The Greeks, as we have already observed, have no peculiar opinions respecting the nature of baptism: but the rites and ceremonies with which that ordinance is administered are very childish and ridiculous; a relation of them would give pain to every one who considers religion as a reasonable service. It may be observed, however, that amid all their trifling rites, they practise trine immersion, which is unquestionably the primitive manner.

For the celebration of the Lord's Supper they have three liturgies that are occasionally used, viz. that of St. Chrysostom, which is in ordinary daily use; that of St. Basil, used on particular days; and that of the presanctified, as is called, which is used on the Wednesdays and Fridays during the great fast before Easter. Between the liturgies of St. Chrysostom and St. Basil there is no essential difference; and the office of the presanctified is merely a form of dispensing the communion with elements which had been consecrated on the preceding Sunday. In the offertory there is a strange ceremony, called the slaying of the Holy Lamb, when the priest, taking into his left hand one of the five loaves which are to be consecrated, thrusts a spear into the right side of it; saying, "He was led as a lamb to the slaughter;" then into the left side, adding, "And as a blameless lamb before his shearers is dumb, so he openeth not his mouth:" then into the upper part of the loaf; saying, "In his humiliation his judgment was taken away:" and into the lower part; adding, "And who shall declare his generation?" He then thrust the spear obliquely into the loaf, lifting it up, and saying, "For his life was taken away from the earth". After this he lays down the loaf, and cutting it crosswise, says, "The Lamb of God, which taketh away the sins of the world, is slain for the life and salvation of the world." All this, and more to the same purpose, is unquestionably modern; but we have no doubt but that the priest uses the words of Chrysostom himself, when, in the consecration of the elements, he says, "We offer unto thee this reasonable, this unbloody sacrifice; and we implore, we pray thee, we humbly beseech thee, to send down thy Holy Spirit upon us, and those oblations presented unto thee; and make this bread the precious body of thy Christ; and that which is in this cup the precious blood

of thy Christ, changing them by thy Holy Spirit."

In the present Greek church transubstantiation is as much an article of faith as in the church of Rome; for now every bishop at his consecration declares, in the most solemn manner, that he believes and "understands that the transubstantiation of the body and blood of Christ, in the holy supper, is effected by the influence and operation of the Holy Ghost, when the bishop or priest invokes God the Father in these words, "and make this bread the precious body of thy Christ, &c." This is indeed a different account from that of the Latin church of the time at which this portentous change is wrought; but such difference is a matter of very little importance. If the change itself be admitted, the consequences must be the same, whether it be supposed to take place when the priest pronounces the words of institution, or after he has invoked the descent of the Holy Ghost; in either case it leads to idolatry. It may be proper to mention, that in the Greek church it is deemed essential to the validity of this holy sacrament, that a little warm water be mixed with the wine; that the napkin, which is spread over the holy table, and answers to the corporale of the church of Rome, be consecrated by a bishop, and that it have small particles of the reliques of a martyr mixed in the web, otherwise the eucharist cannot be administered. In this church children may receive the communion immediately after baptism; and this, indeed, however absurd, appears to us the only way of making the principles of Pædo-baptism consistent with themselves. The lay communicants, of whatever age, receive both the elements together, the bread being sopped in the cup: the clergy receive them separately.

We have observed, that one of the seven mysteries or sacraments of the Greek Church is confession; but among the Greeks it is a much more rational and edifying service than in the church of Rome. In the Greek church the end of confession is the amendment of the penitent; in the church of Rome it is to magnify the glory of the priest. In the former church, the confessors pretend only to abate or remit the penance, declaring the pardon from God alone; in the latter, they take upon them to forgive the sin itself. The Greek church prescribes confession four times a year to all her members; but the laity, for the most part, confess only once a year previous to receiving the holy communion; and to this they are in Russia obliged by the laws of the empire.

The ceremonies with which matrimony is performed in the Greek church consist of three distinct offices, formerly celebrated at different times, after certain intervals, which now make but one service. First, there was a solemn service, when the parties betrothed themselves to each other, by giving and receiving rings or other presents, as pledges of their mutual fidelity and attachment. The ancient usage was for the man to receive a gold ring and the woman a silver one, which is still alluded to in the rubric, though in the present practice, the rings are generally both of gold. At this time the dowry was paid, and certain obligations were entered into to forfeit sums in proportion to it, if either party should refuse to ratify the engagement. At this ceremony, called the *μνῆστρα*, or *recording of the pledges before witnesses*, the priest gives lighted tapers to the parties to be contracted, making the sign of the cross on the forehead of each with the end of the taper before he delivers it. The second ceremony, which is properly the marriage, is called the office of matrimonial coronation, from a singular circumstance in it, that of crowning the parties. This is done in token of the triumph of continence; and therefore it has, in some places, been omitted at second marriages. Formerly these crowns were garlands made of flowers or shrubs; but now there are kept, in most churches, crowns of silver or some other metal for the celebration of matrimony. At the putting of them on, the priest says, "N, the servant of God, is crowned for the handmaid of God;" and "N, handmaid of God, is crowned for the servant of God, in the name of the Father, and of the Son, and of the Holy Ghost;" adding thrice, "O Lord our God, crown them with glory and honour."

The third ceremony is that of dissolving the crowns on the eighth day; after which the bride is conducted to the bridegroom's house, immediately to enter on the cares of his family.

With respect to discipline and government, the Greek church bears a striking resemblance to that of Rome. In both there is the same division of the clergy into regular and secular; the same spiritual jurisdiction of bishops and their officials, and the same distinction of ranks and offices. In some points the discipline of the Greeks differs from that of the Romans. All orders of secular clergy in the Greek church inferior to bishops are permitted to marry; but celibacy, and the assumption of the monastic habits, are indispensably requisite in those who are candidates for the mitre. The regular clergy, says Mr. Dallaway, are generally men of a certain education; whereas the seculars are of the meaner sort, and illiterate in the extreme.

In the Greek church there are five orders of clergy promoted by the imposition of hands; but it does not appear that the ordination of the reader, or of the subdeacon, is considered as a sacrament. The forms used in the ordination of deacons, presbyters, and bishops, are serious and significant, bearing in themselves evidence of great antiquity. The candidate for the deaconate or priesthood kneels before the holy table, and the bishop, laying his right hand on his head, saith, "The divine grace, which healeth our infirmities, and supplieth our defects, promoteth N, the most pious sub-deacon, to the order of deacon;" or, in the case of the priesthood, "The most pious deacon to the order of a presbyter; let us pray for him, that the grace of the Holy Spirit may come upon him." It does not appear, from Dr. King's account of these offices, that in the Greek church the attending presbyters lay on their hands together with the bishop, at the ordination of a presbyter, as is practised in the church of England; but several bishops lay on their hands together with the archbishop, at the consecration of a bishop. Indeed the whole of the consecration of a bishop is a solemn and impressive ceremony. It concludes with a prayer, that Christ will make the new bishop an imitation of himself, the true shepherd; that he will make him a leader of the blind, a light to those who walk in darkness, and a teacher of infants; that he may shine in the world, and receive at last the great reward prepared for those who contend boldly for the preaching of the gospel. After this the pastoral-staff is delivered to the new bishop, with a very proper and solemn exhortation from the archbishop, to feed the flock of Christ committed to his care.

The last sacrament of the Greek church is that of the holy oil or euchelaion, which is not con-

fined to persons "periculose ægrotantibus, et mortis periculo imminente," like the extreme unction of the Romish church; but is administered, if required, to devout persons upon the slightest malady. Though this ordinance is derived from St. James, chap. v. ver. 14, 15. it is by no means deemed necessary to salvation, or obligatory upon all Christians; and it is well that it is not, for seven priests are required to administer it regularly, and it cannot be administered at all by less than three. The oil is consecrated with much solemnity; after which each priest, in his turn, takes a twig, and dipping it in the oil now made holy, anoints the sick person cross-wise, on the forehead, on the nostrils, on the paps, the mouth, the breast, and both sides of the hands, praying that he may be delivered from the bodily infirmity under which he labours, and raised up by the grace of Jesus Christ.

In the Greek, as well as in the Latin church, there is a service, called the divine lavipedium, observed on the Thursday of Passion-week, in imitation of our Saviour's humility. At Constantinople Jesus Christ is, on this occasion, personified by the patriarch, and every where else by the bishop of the diocese, and the twelve apostles by twelve regular priests, when a ludicrous contest arises who shall represent Judas; for the name attaches for life. This office is performed at the west end of the church, where an arm-chair is set at the bottom, facing the east, for the bishop; and on each side are placed twelve chairs for the twelve priests, who are to represent the twelve apostles. The prayers and hymns used on this occasion are exceedingly beautiful and appropriate; and when the first gospel, relating our Saviour's washing of his disciples feet, begins to be read, the bishop or patriarch rises up, and takes off his pontifical vestments by himself without assistance. He then girds himself with a towel, and taking a bason of water in his hand, kneels down and washes one foot of each priest, beginning with the youngest; and after having washed it he kisses it. All this is done as the several circumstances are read; and when he comes to the last priest, who is supposed to represent Peter, that priest rises up and saith, "Lord, dost thou wash my feet?" &c. The bishop answers in the words of our Saviour; and having finished the whole, puts on his garments again, and sits down; and as the second gospel is read, repeats the words of our Saviour, "Know ye what I have done unto you?" &c. The office is certainly ancient, and if decently performed may be affecting.

Among the Russian festivals, the King's day, or the benediction of the waters, is very singular. It is celebrated at the beginning of the year, and is thus described by Chantreau. "On the Neva, then frozen, there is raised for this ceremony a kind of temple, of an octagonal figure, on the top of which is a St. John the Baptist, and the inside is decorated with pictures, representing the baptism of Jesus, his transfiguration, and some other parts of his life. There your attention is drawn to an enormous Holy Ghost, appearing to descend from heaven, a decoration common to all the Greek churches, which introduces the Holy Ghost every where. In the middle of the sanctuary is a square space, where the broken ice leaves a communication with the waters running below, and the rest is ornamented with rich tapestry. Around this temple there is erected a kind of gallery, which communicates with one of the windows of the imperial palace, at which the empress and her family come out to attend the ceremony, which begins as soon as the regiments of guards have taken post on the river. Then the archbishop, at the sound of the bells, and of the artillery of the fortress, comes out of the palace, and walks in procession, with all his clergy, to the little temple we have just mentioned. When arrived at the place where the ice is broken, he descends, by means of a ladder, to the side of the water. There he dips his cross three or four times, aferwards says some prayers, an orison to the great St. Nicholas, and the waters are then thought blessed. The prelate sprinkles the water on the company around him, and on the colours of all the regiments that happen to be at St Petersburg. After this benediction, the archbishop retires. Then the people crowd towards the hole, by which this prelate has blessed the waters. They drink of them with a holy avidity. Notwithstanding the cold, the mothers plunge their infants, and the old men their heads, into them. Every body makes it a duty to carry away some for the purification of their houses, and curing certain distempers, against which the good Russians pretend this holy water is a powerful specific. While every one proceeds to this useful provision, four popes, who are at the four corners of the sanctuary, sing a kind of litany in which they rehearse all the titles of the empress, and to which the people answer by these words, *Pameloi-Bog*—"May God take pity on her." Since the death of the empress, this part of the service has, we doubt not, received a correspondent alteration.

Among the Greek clergy, the next person to a bishop is an archimandrite, who is the director of one or more convents, which are called mandren; then come the abbot, the arch-priest, the priest, the deacon, the under-deacon, the chanter, and the lecturer. The secular clergy are subjected to no rules, and never rise higher than high-priest. They are allowed to marry once; but it must be with a virgin, and before they are ordained. They have neither glebe nor tythes, but depend on the perquisites that arise from their office; and they seldom preach but in Lent. The head of the Greek church is the patriarch of Constantinople; who is chosen by the neighbouring archbishops and metropolitans, and confirmed by the emperor or grand visir. He is a person of great dignity, being the head and director of the eastern church. The other patriarchs are those of Jerusalem, Antioch, and Alexandria. Mr. Tournefort tells us, that the patriarchates are now generally set to sale, and bestowed upon those who are the highest bidders. It may be proper to add here, that after the taking of Constantinople by Mahommed II. he continued to the patriarch of that city the same present which the Greek emperors had been accustomed to make—a pastoral staff, a white horse, and four hunded ducats in gold. To the Greek church and the maintenance of its clergy he left indeed ample revenues, which they have gradually sacrificed to their inconstancy, their ambition, and their private jealousy. Still, however, the patriarch of Constantinople fills a very lucrative and high office. "Besides the power of nominating the other three patriarchs, and all episcopal dignitaries (says Mr. Dallaway), he enjoys a most extensive jurisdiction, comprising the churches of Anatolia, Greece, Wallachia, Moldavia, and the islands of the Archipelago,

Since the close of the sixteenth century, the Russian church has claimed a jurisdiction independent of the see of Constantinople; though appeals have been made to that see in cases of extraordinary importance. The influence of the patriarch with the Porte is very extensive as far as his own nation is concerned. His memorials are never denied; and he can, in fact, command the death, the exile, imprisonment for life, deposition from offices, or pecuniary fine, of any Greek whom he may be inclined to punish with rigour, or who has treated his authority with contempt. On the death of the patriarch the most eager competition is exerted to fill the vacant throne; which, as it is obtained by bribery and intrigue, is of course a very unstable seat to the successful candidate, should another offer to accept the appointment at a lower salary." For a fuller account of the doctrines, discipline, and worship of the Greek church at present, we refer the reader to King's Rites and Ceremonies of the Greek Church in Russia, and to Dallaway's Constantinople ancient and modern (published in 1797); from which two works this abstract has been mostly taken.

GREEK ORDERS, in architecture. See DORIC, IONIC, and CORINTHIAN.

GREEK VALERIAN, in botany. See POLEMONIUM.

GREEN. *a.* (*grun*, German; *groen*, Dutch.) 1. Having a colour formed by compounding blue and yellow (*Pope*). 2. Pale; sickly (*Shakspeare*). 3. Flourishing; fresh; undecayed (*Dryden*). 4. New; fresh: as, a *green* wound (*Shakspeare*). 5. Not dry (*Hooker*). 6. Not roasted; half raw (*Watts*). 7. Unripe; immature; young (*Shakspeare*).

GREEN. *s.* 1. The green colour (*Dry.*). 2. A grassy plain (*Milton*). 3. Leaves; branches; wreathes (*Dryden*).

To GREEN. *v. a.* (from the noun.) To make green (*Thomson*).

GREEN-CLOTH, a board, or court of justice, held in the compting-house of the king's houshold, for the taking cognizance of all matters of government and justice within the king's court royal; and for correcting all the servants therein that shall any way offend.

To this court also belongs the authority of maintaining the peace for twelve miles round the king's court, wherever it shall be, excepting at London.

The judge of this court is the lord steward, assisted by the treasurer, comptroller, cofferer, clerks of the green-cloth, &c. It takes its name, green-cloth, from a green cloth spread over the board where they sit, whereon are the arms of the compting-house.

GREEN-EARTH. Terre verte, Brochart; grünerde, Emmerling. A satillitic earth of amygdalites or almond-stone. It is found wherever this stone occurs, as in Saxony, Bohemia, Monte Baldo, near Verona, Scotland, &c. The colour of this mineral is celandine-green, passing into mountain and blackish-green, rarely into olive-green: when of a good colour it is sometimes employed by painters. It occurs in mass, in angular or globular pieces, or disseminated. It is also found lining balls of agate with a superficial covering, as well as giving an interior coating to the cavities of amygdaloids. Its fracture is fine-grained earthy, passing into indeterminate, blunt-edged fragments. It gives a shining streak; is smooth and somewhat unctuous to the touch; very soft; opake; adheres slightly to the tongue; is light and easily frangible. When exposed to the blow-pipe it blackens, but does not melt by itself; with borax it gives a brownish-black opake glass; when immersed in water it absorbs a considerable quantity, but does not break down in it or become plastic.

GREEN FINCH, in ornithology. See LOXIA.

GREEN-HOUSE, or CONSERVATORY, a house in a garden contrived for sheltering and preserving the most tender and curious exotic plants, which, in our climate, will not bear to be exposed to the open air during the winter season. These are generally large and beautiful structures, equally ornamental and useful. The length of these houses, says Mr. Miller, must be proportioned to the number of plants they are to contain; but their depth should never be greater than their height in the clear; which in small or middling houses may be sixteen or eighteen feet, and in large ones from twenty to twenty-four. The windows in front should extend from about one foot and a half above the pavement, to within the same distance of the ceiling, which will admit of a cornice round the building, over the heads of the windows. In a small green-house, the sashes should not be less than four or five feet broad, and in a large one they should not exceed seven and a half; the shutters of which ought to fall back close to the piers on the inside, that when open, they may not prevent any of the rays of light from reaching the plants. The piers between these windows, which support the building, should be as narrow as possible, for which reason they should either be of stone or of well-burnt brick. If of stone, they ought not to exceed two feet and a half in front, and should be sloped off backwards about eighteen inches broad, by which means the rays of the sun will not be obstructed by the corners of the piers; which they would be, if they were square: but if built with brick, it will be proper to make them near three feet in front, otherwise they will be too weak to support the building: these ought also to be sloped off in the manner directed for those of stone. Over the green-house there may be rooms for drying and preserving seeds, roots, &c. and behind it, a house for tools and other purposes, which will prevent the frost from entering that way, so that the wall between them need not be more than two bricks and a half in thickness.

The floor of the green-house, which should be either laid with marble, common stone, or broad tiles, must be raised two feet above the surface of the ground on which the house is placed; or, if the situation be moist, at least three feet: and if the whole be raised upon low brick arches under the floor, it will be of great service in preventing the damps rising in winter. Under the floor, about three feet

from the front, it will be adviseable to make a flue of about ten inches in width, and two feet deep, to be extended the whole length of the house, which may be returned along the back part, and the smoke be carried up into funnels adjoining the tool-house. The fire-place may be contrived at one end of the house; and the door at which the fuel is introduced, as also the ash-grate, should enter into the tool-house; where the fuel being likewise laid, the whole will be out of sight. Fires, however, must be very sparingly used in this place: not one winter in three or four will require them to be lighted, since this ought never to be done but when the frost cannot well be kept out any other way. Indeed the coldest weather cannot make it necessary for the green-house to be shut up close for a long time together, which would be attended with very ill consequences; for as it frequently happens, that in continued frosts we have an hour or two of sun-shine in the middle of the day, it will be of great service to the plants if they be allowed to enjoy its rays through the glasses; but the window-shutters should be closed again as soon as it is clouded. The inside of the house should either be whitewashed or painted white; for this colour reflects the rays of light in a greater quantity than any other. In this green-house there should be trussels, upon which rows of planks should be fixed, in order to hold the pots or tubs of plants, the foremost of which should be placed four feet from the window, and the rows behind rise gradually from the first, in such a manner, that the heads of the second row be entirely advanced above the first, the stems only being hid by it: and at the back part there should be allowed at least a space of five feet, for the conveniency of watering the plants, and admitting a current of air around them: care should also be taken not to place the plants too close to each other, nor ever to place euphorbiums, sedums, torch-thistles, and other tender succulent plants, amongst oranges, myrtles, and other ever-greens. To avoid the inconvenience of placing plants of very different natures in the same house, it will be proper to have two wings added to the main green-house, which may largely add to the beauty of the building, and also collect a greater share of heat. Upon this plan the green-house is supposed exactly to front the south, one of the wings to face the south-east, and the other the south-west: so that from the time of the sun's first appearance upon any ~~part of~~ the building, till his departure at night, he will be constantly reflected from one part to the other, and the cold winds will be also kept off from the front of the main green-house. In the area may be placed many of the tender exotic plants, that will bear to be exposed in the summer season; and in the spring, before the weather will permit the plants to be set out, the beds and borders of this area may be filled with anemonies, ranunculuses, tulips, &c.

In the center of this area may be introduced a small bason for water, which will be very convenient for watering the plants; and the two wings of the building should be so contrived as to maintain plants of different degrees of hardiness, which should be effected by the situation and extent of the fire-place, and the manner of conducting the flues. If the wings be sixty feet in length they may be conveniently divided in the middle by partitions of glass, with glass doors, and to each of them should be a fire-place, with flues carried up against the back wall. The sloping glasses of these houses should be made to slide and take off at pleasure, so as to admit air to the plants, according to the temperature of the external atmosphere.

GREENE (Dr. Maurice), an eminent musician, and professor of music at Cambridge, was a native of London. He began the work of correcting and reforming the church music, greatly corrupted by transcribers; which undertaking was completed by his friend Dr. Boyce. He died in 1755.

GRE'ENEYED. *a.* (*green* and *eye*.) Having eyes coloured with green.

GRE'ENISH. *a.* (from *green*.) Somewhat green; tending to green.

GREENSHANK, in ornithology. See SCOPOLAX.

GREENLAND, a general name by which are denoted the most easterly parts of America, stretching towards the north pole, and likewise some islands to the north of the continent of Europe, lying in very high latitudes. This country is divided into West and East Greenland. West Greenland was discovered in the ninth century, by the Norwegians, who planted colonies there. The communication with that country, after a long interruption, was renewed in the last century. From the Lutheran and Moravian missionaries, who settled in this frozen and uncultivated region, we learn that the N. W. coast of Greenland is separated from America by a very narrow strait; that, at the bottom of the bay into which this strait conducts, it is highly probable they are united; that the inhabitants of the two countries have some intercourse; and that the Eskimaux of America much resemble the Greenlanders in their aspect, dress, mode of living, and language. East Greenland was, for a long time, considered as a part of the continent of West Greenland, but is now ascertained to be an assemblage of islands lying between 9. and 20 E. Lon. and 76. 40 and 80. 30 N. lat. It was discovered, in 1533, by Sir Hugh Willoughby, who called it Greenland, supposing it to be a part of the Western Continent. In 1595, it was visited by Barentz, and Cornelius, who pretended to be the original discoverers, and called it Spitzbergen, or sharp mountains, from the many sharp-pointed and rocky mountains with which it abounds. The only quadrupeds of either West or East Greenland are deer, white bears, and foxes. To its frozen seas the English, and other nations, repair annually in the proper season, to fish for whales. See SPITZBERGEN.

Early in the last century, Hans Egede, minister of Vogen, in Norway, prompted by a

laudable zeal to promote the knowledge of Christ among the savage Greenlanders, made some proposals for renewing the intercourse between Denmark and Norway, and Greenland, which had been discontinued for some centuries. Most of the friends and acquaintance of this worthy divine, when they heard of his project, looked upon it as a chimerical undertaking. However, in the year 1718, he resigned his benefice in the south part of Norway, and removed with his wife and children to Bergen. His proposals did not meet with a favourable reception either from the merchants or clergy of that city. He therefore went to Copenhagen, in 1719, and laid his plan before the king; who sent an order to the magistracy of Bergen, to propose to the citizens the erecting of a Greenland company. This, after many difficulties, was at last effected in the year 1721, and a capital of 10,000 rix dollars was raised for that purpose. The new established company fitted out three ships for Greenland; and the indefatigable Egede was sent thither as missionary, and furnished with 300 guilders by the society for propagating the gospel at Copenhagen. It was not without great danger and difficulty that the single ship which had the missionary on board at length arrived off a place called Baal's-River, on the west side of Greenland, in latitude sixty-four degrees, and wintered on an island there. M. Egede, and forty men who remained with him, immediately set about building a house, in which the natives readily lent them a helping hand. This new colony was, from year to year, carefully supplied with necessaries by the company; but the trade carried on with Greenland brought in no great profit. In the mean while, the missionary employed his time in learning the Greenland language; and by his liberality and sweetness of manners so endeared himself to the inhabitants, that the respect they showed him in some particulars far exceeded his wishes; for they entertained such an exalted idea of his piety and virtue, that all the sick flocked about him, imploring him to heal them, being persuaded that his breathing on them would restore them to health. In 1731, a royal edict was published, enjoining all the king's subjects in Greenland to return home, and the colonies were thereby dissolved. But M. Egede, being zealous for the salvation of the inhabitants, staid behind, together with his family, and some others who chose to follow his fortunes. In 1733, the Greenland trade was re-assumed with great vigour; and the king granted a pension of 2000 rix-dollars a year to the missionaries. In the year 1736, M. Egede returned to Denmark, after a residence of fifteen years, which he had spent in a zealous endeavour to do good, and left behind him a great number of converts.

GREENLAW, the county town of Berwickshire, seated on a river that joins the Tweed, before it reaches Berwick. Lat. 55. 43 N. Lon. 2. 18 W.

GRE'ENLY. *ad.* (from *green.*) 1. With a greenish colour. 2. Newly; freshly. 3. Immaturely. 4. Wanly; timidly: not in use (*Shakspeare*).

GRE'ENNESS. *s.* (fom *green.*) 1. The quality of being green; viridity. 2. Immaturity; unripeness (*Sidney.*) 3. Freshness; vigour (*South.*) 4. Newness.

GREENOCK, a seaport in Renfrewshire, at the mouth of the Clyde. It is a place of great resort for shipping, and has a great share in the herring fishery. Here is a sugar house, also a rope and sail manufactory. Its inhabitants amount to 17458. Lat. 55. 54 N. Lon. 4. 29 W.

GREENSBURG, the county town of Westmoreland, in Pennsylvania. Lat. 40. 8 N. Lon. 78. 36 W.

GRE'ENSICKNESS. See CHLOROSIS.

GRE'ENSWARD. GREENSWORD. *s.* (*green* and *sward.*) The turf on which grass grows (*Shakspeare. Swift*).

GRE'ENWEED. *s.* (*green* and *weed.*) Died weed.

GREENWICH, a town of England, in the county of Kent, situated on the banks of the Thames, anciently called East Greenwich. It formerly belonged to the abbot of Ghent, from whom it was seized by Henry V. and given to Shene; at the dissolution it came to the crown. Here was formerly a palace, in which queen Mary and queen Elizabeth were born, and Edward VI. died. This palace was first erected by Humphry, duke of Gloucester, enlarged by Henry VII. and completed by Henry VIII.; but being afterwards suffered to run to ruin, was pulled down by king Charles II. who began another, a most magnificent edifice, and lived to see the first wing finished. King Charles II. also enlarged the park, walled it round, planted it, and caused a royal observatory to be erected on the top of the steep of the hill. This edifice was erected for the use of the celebrated Mr. Flamsteed, and it still retains the name of that great astronomer: it was likewise furnished with mathematical instruments for astronomical observations, and a deep dry well for observing the stars in the day-time. Here is likewise an excellent camera obscura, so contrived as to present successively the pictures of surrounding objects, upon a table of plaister of Paris, about 3 feet in diameter. British navigators look upon the meridian of Greenwich as the first meridian from whence the longitudes are estimated; and the tables in the Nautical Almanac, and Requisite Tables, are adopted to the meridian of Greenwich: but in gazetteers, &c. the longitudes are now generally reckoned from London, as the first meridian, which is 5. 37 W. of that of Greenwich. In this work we always estimate the longitudes from London, unless the contrary is expressed.

The parish church of Greenwich, which was rebuilt last century by the commissioners for erecting the fifty new churches, is a very handsome structure, dedicated to St. Alphage, archbishop of Canterbury, who is said to have been slain by the Danes, in the year 1012, on the spot where the church now stands. The

Thames is here very broad, and the channel deep; and at some very high tides the water is salt, though it is usually sweet and fresh. Greenwich Hospital stands on the spot where stood the palace of several of our kings. The first wing of this noble and superb edifice, erected by king Charles II. was designed to be applied to the same use. William III. erected another wing, and adopted the plan of applying it to the use of English seamen incapable of service either through age or infirmity, but the whole was not finished till the reign of George II. Besides the seamen who are provided for, there are 140 boys, the sons of seamen, instructed in navigation, and bred up for the service of the royal navy: but there are no out-pensioners as at Chelsea. Each of the mariners has a weekly allowance of seven loaves, weighing sixteen ounces each; three pounds of beef; two of mutton; a pint of peas; a pound and a quarter of cheese; two ounces of butter; fourteen quarts of beer, and one shilling a week tobacco-money: the tobacco-money of boatswains is 2s. 6d. a week each, and that of their mates 1s. 6d. and the other officers in proportion to their rank. Besides which, each common pensioner receives once in two years a suit of blue clothes, a hat, three pair of stockings, two pair of shoes, five neckcloths, three shirts, and two night-caps. This hospital has about 100 governors, composed of the nobility, great officers of state, and persons in high posts. For the better support of this hospital, every seaman in the royal navy, and in the service of the merchants, pays 6d. every month. This is stopped out of the pay of all sailors, and delivered in the Sixpenny Receiver's office, Tower Hill; and, therefore, a seaman who can produce an authentic certificate of his being disabled and rendered unfit for the sea service by defending any ship belonging to British subjects, or in taking any ship from the enemy, may be admitted into this hospital, and receive the same benefit from it as if he had been in the king's service. Greenwich is a populous town; it contains 2121 houses, and 14339 inhabitants. Its markets are on Wednesdays and Saturdays.

GRE'ENWOOD. *s.* (*green* and *wood.*) A wood considered as it appears in the spring or summer (*Dryden*).

To GREET. *v. a.* (*grater*, Lat. ᵹretan, Sax.) 1. To address at meeting (*Donne*). 2. To address in whatever manner (*Shakspeare*). 3. To salute in kindness or respect (*Dryden*). 4. To congratulate (*Spenser.*) 5. To pay compliments at a distance (*Shakspeare*). 6. To meet, as those do who go to pay congratulations (*Pope*).

To GREET. *v. n.* To meet and salute (*Shak.*)

GREETER. *s.* (from the verb.) He who greets.

GREETING. *s.* (from *greet.*) Salutation at meeting, or compliments at a distance (*Shakspeare*).

GREEZE. *s.* A flight of steps; a step.

GRE'GAL. *a.* (*grex*, *gregis*, Latin.) Belonging to a flock.

GREGA'RIOUS. *a.* (*gregarius*, Latin.) Going in flocks or herds (*Ray*).

GREGORIAN CALENDAR, that which shows the new and full moon, with the time of Easter, and the moveable feasts depending thereon, by means of epacts, disposed though the several months of the Gregorian year.

GREGORIAN EPOCH, the epocha, or time whence the Gregorian calendar or computation took place. The year 1809 was the 227th year of that epocha.

GREGORIAN YEAR, the Julian year corrected, or modelled, in such a manner as that three secular years, which in the Julian account are bissextile, are here common years, and only every fourth secular year is made a bissextile year.

The Julian computation is more than the solar year by eleven minutes, which in one hundred and thirty-one years amounts to a whole day. By this calculation, the vernal equinox was anticipated ten days from the time of the general council of Nice, held in the year 325 of the christian æra, to the time of pope Gregory XIII. who therefore caused ten days to be taken out of the month of October, in 1582, to make the equinox fall on the twenty-first of March, as it did at the time of that council; and to prevent the like variation for the future, he ordered that three days should be abated in every four hundred years, by reducing the leap year at the close of each century for three successive centuries to common years, and retaining the leap year at the close of each fourth century only.

This was at that time esteemed as exactly conformable to the true solar year, but it is found not to be strictly just, because that in four hundred years it gains one hour and twenty minutes, and consequently in 7200 years, a whole day.

The greatest part of Europe have long used the Gregorian style: but Great Britain retained the Julian till the year 1752, when by act of parliament this style was adjusted to the Gregorian; since which time Sweden, Denmark, and other European states, who computed time by the Julian account, have followed this example.

GREGORY (Nazianzen), an illustrious bishop of Constantinople, was born in 324, not far from Nazianzum, a town of the second Cappadocia, of which place his father was bishop. In his youth he visited most of the celebrated schools of the times. When the emperor Julian prohibited the Christians from reading the books of the Gentiles, Nazianzen wrote poems to furnish the christian youth with subjects of entertainment and study. On the death of Julian he published two orations against that emperor, replete with wit and eloquence. In 378 he was appointed, by the council of Antioch, to repair to Constantinople to suppress Arianism, and was chosen bishop there by the catholic congregation. He afterwards resigned that see and retired to his native country, where he died in his 66th year. He was one of the ablest champions of the

doctrine of the trinity, and was a man not only of an acute but a sublime genius.

GREGORY, the first pope of Rome of that name, and who acquired the title of the Great, was descended from an illustrious patrician family at Rome, where he was born about the year 544. He was appointed præfect of the city, and held other civil dignities; but, being inclined to a religious life, he retired to the monastery of St. Andrew, which he himself had founded. From this retreat he was drawn by pope Pelagius II. who employed him in his affairs, and made him his secretary. He, however, obtained leave to retire again to his monastery, of which he was made abbot. On the death of Pelagius, in 590, he was elected pope. He conducted the affairs of the pontificate with great ability and success till the year 604, when he died. It deserves to be mentioned that this pope converted the English to Christianity.

There were fourteen other popes named Gregory, the last of whom, Alexander Ludovisco, was elected pontiff in 1621, and died in 1623.

GREGORY (James), one of the most eminent mathematicians of the last century, was a son of the Rev. Mr. John Gregory, minister of Drumoak in the county of Aberdeen, and was born at Aberdeen in 1638. His mother was a daughter of Mr. David Anderson of Finzaugh, a gentleman who possessed a singular turn for mathematical and mechanical knowledge. This mathematical genius was hereditary in the family of the Andersons, and from them seems to have been transmitted to their descendants of the name of Gregory. Alexander Anderson was cousin-german of the above-mentioned David. The mother of James Gregory inherited the genius of her family; and observing in her son, while yet a child, a strong propensity to mathematics, she instructed him herself in the elements of that science. He received his education in the languages at the grammar school of Aberdeen, and went through the usual course of academical studies in the Marischal college. At the age of twenty-four he published his treatise, intitled Optica Promota, seu abdita radiorum reflexorum et refractorum mysteria, geometrice enucleata; cui subnectitur appendix subtilissimorum astronomiæ problematon resolutionem exhibens, London 1663: a work of great genius, in which he gave the world an invention of his own, and one of the most valuable of the modern discoveries, the construction of the reflecting telescope. This discovery immediately attracted the attention of the mathematicians, both of our own and foreign countries, who were soon convinced of its great importance to the sciences of optics and astronomy.

The university of Padua being at that time in high reputation for mathematical studies, James Gregory went thither soon after the publication of his first work; and fixing his residence there for some years, he published in 1667, Vera Circuli et Hyperboles quadratura; in which he propounded another discovery of his own, the invention of an infinitely converging series for the areas of the circle and hyperbola. To this treatise, when published in 1668, he added a new work, intitled, Geometriæ pars universalis, inserviens quantitatum curvarum transmutationi et mensuræ; in which he is allowed to have shown, for the first time, a method for the transmutation of curves. These works engaged the notice, and procured Mr. Gregory the correspondence, of the greatest mathematicians of the age, Newton, Huygens, Halley, and Wallis; and their author being soon after chosen a fellow of the Royal Society of London, contributed to enrich the Philosophical Transactions at that time by many excellent papers. Through this channel, in particular, he carried on a dispute with Mr. Huygens, upon the occasion of his treatise on the quadrature of the circle and hyperbolas, to which that able mathematician had started some objections. Of this controversy, it is unnecessary to enter into particulars. It is sufficient to say, that, in the opinion of Leibnitz, who allows Mr. Gregory the highest merit for his genius and discoveries, Mr. Huygens has pointed out, though not errors, some considerable deficiencies in the treatise above mentioned, and shown a much simpler method of attaining the end in view. In 1668 Mr. James Gregory published at London another work, intitled Exercitationes Geometricæ, which contributed still more to extend his reputation. About this time he was elected professor of mathematics in the university of St. Andrew's; an office which he held for six years. During his residence there, he married in 1669 Mary, the daughter of George Jameson, the celebrated painter, whom Mr. Walpole has termed the Vandyke of Scotland, and who was fellow-disciple with that great artist in the school of Rubens at Antwerp. In 1672, he published, "The Great and New Art of Weighing Vanity: or a Discovery of the Ignorance and Arrogance of the Great and New Artist, in his Pseudo-philosophical Writings. By M. Patrick Mathers, Arch-bedal to the University of St. Andrews. To which are annexed some Tentamina de Motu Penduli et Projectorum." Under this asumed name, our author wrote this little piece to expose the ignorance of Mr. Sinclare, professor at Glasgow, in his hydrostatical writings, and in return for some ill usage of that author to a colleague of Mr. Gregory's. The same year, Newton, on his wonderful discoveries in the nature of light, having contrived a new reflecting telescope, and made several objections to Mr. Gregory's, this gave birth to a dispute between those two philosophers, which was carried on during this and the following year, in the most amicable manner on both sides; Mr. Gregory defending his own construction so far, as to give his antagonist the whole honour of having made the catoptric telescopes preferable to the dioptric; and shewing, that the imperfections in these instruments were not so much owing to a defect in the object speculum, as to the different refrangibility of the rays of light. In the course

of this dispute, our author described a burning concave mirror, which was approved by Newton, and is still in good esteem. Several letters that passed in this dispute are printed by Dr. Desaguliers, in an Appendix to the English edition of Dr. David Gregory's Elements of Catoptrics and Dioptrics.

In 1674, Mr. Gregory was called to Edinburgh, to fill the chair of mathematics in that university. This place he had held but little more than a year, when, in October 1675, being employed in shewing the satellites of Jupiter through a telescope to some of his pupils, he was suddenly struck with total blindness, and died a few days after, to the great loss of the mathematical world, at only 37 years of age.

As to his character, Mr. James Gregory was a man of a very acute and penetrating genius. His temper seems to have been warm, as appears from his conduct in the dispute with Huygens; and, conscious perhaps of his own merits as a discoverer, he seems to have been jealous of losing any portion of his reputation by the improvements of others upon his inventions. He possessed one of the most amiable characters of a true philosopher, that of being content with his fortune in his situation. But the most brilliant part of his character is that of his mathematical genius as an inventor, which was of the first order; as will appear by the following list of his inventions and discoveries. Among many others may be reckoned, his Reflecting Telescope; Burning Concave Mirror; Quadrature of the Circle and Hyperbola, by an infinite converging series; his method for the Transformation of Curves; a Geometrical Demonstration of Lord Brounker's Series for Squaring the Hyperbola—his Demonstration that the Meridian Line is analogous to a scale of Logarithmic Tangents of the Half Complements of the Latitude; he also invented and demonstrated geometrically, by help of the hyperbola, a very simple converging series for making the logarithms; he sent to Mr. Collins the solution of the famous Keplerian problem by an infinite series; he discovered a method of drawing Tangents to Curves geometrically, without any previous calculations; a rule for the Direct and Inverse method of Tangents, which stands upon the same principle (of exhaustions) with that of fluxions, and differs not much from it in the manner of application; a Series for the length of the Arc of a Circle from the Tangent, and vice versa; as also for the Secant and Logarithmic Tangent and Secant, and vice versa: These, with others, for measuring the length of the elliptic and hyperbolic curves, were sent to Mr. Collins, in return for some received from him of Newton's, in which he followed the elegant example of this author, in delivering his series in simple terms, independent of each other.

GREGORY (David), was a son of the Rev. John Gregory, minister of Drumoak, in the county of Aberdeen, and elder brother to Mr. James Gregory, the inventor of the most common reflecting telescope. He was born about the year 1627 or 1628; and though he possessed all the genius of the other branches of his family, he was educated by his father for trade, and served an apprenticeship to a mercantile house in Holland. Having a stronger passion, however, for knowledge than for money, he abandoned trade in 1655; and returning to his own country, he succeeded, upon the death of an elder brother, to the estate of Kinardie, situated about forty miles north from Aberdeen, where he lived many years, and where thirty-two children were born to him by two wives. Of these, three sons made a conspicuous figure in the republic of letters, being all professors of mathematics at the same time in three of the British universities, viz. David at Oxford, James at Edinburgh, and Charles at St. Andrews.

Mr. Gregory, the subject of this memoir, while he lived at Kinardie, was a jest among the neighbouring gentlemen for his ignorance of what was doing about his own farm, but an oracle in matters of learning and philosophy, and particularly in medicine, which he had studied for his amusement, and began to practise among his poor neighbours. He acquired such a reputation in that science, that he was employed by the nobility and gentlemen of that county, but took no fees. His hours of study were singular. Being much occupied through the day with those who applied to him as a physician, he went early to bed, rose about two or three in the morning, and, after applying to his studies for some hours, went to bed again and slept an hour or two before breakfast.

He was the first man in that country who had a barometer; and having paid great attention to the changes in it, and the corresponding changes in the weather, he was once in danger of being tried by the presbytery for witchcraft or conjuration. A deputation of that body waited upon him to enquire into the ground of certain reports that had come to their ears; but he satisfied them so far as to prevent the prosecution of a man known to be so extensively useful by his knowledge of medicine.

About the beginning of the last century he removed with his family to Aberdeen, and in the time of Queen Anne's war employed his thoughts upon an improvement in artillery, in order to make the shot of great guns more destructive to the enemy, and executed a model of the engine he had conceived. Dr. Reid informs us, that he conversed with a clock-maker in Aberdeen, who had been employed in making this model; but having made many different pieces by direction without knowing their intention, or how they were to be put together, he could give no account of the whole. After making some experiments with this model, which satisfied him, the old gentleman was so sanguine in the hope of being useful to the allies in the war against France, that he set about preparing a field equipage with a view to make a campaign in Flanders,

and in the mean time sent his model to his son the Savilian professor, that he might have his and sir Isaac Newton's opinion of it. His son shewed it to Newton, without letting him know that his own father was the inventor. Sir Isaac was much displeased with it, saying, that if it had tended as much to the preservation of mankind as to their destruction, the inventor would have deserved a great reward; but as it was contrived solely for destruction, and would soon be known by the enemy, he rather deserved to be punished, and urged the professor very strongly to destroy it, and if possible to suppress the invention. It is probable the professor followed this advice. He died soon after, and the model was never found.

If this be a just account of the matter, and Dr. Reid's veracity is unquestionable, we cannot help thinking that Newton's usual sagacity had, on that occasion, forsaken him. Were the implements of war much more destructive than they are, it by no means follows that more men would be killed in battle than at present. Muskets and cannons are surely more destructive weapons than javelines and bows and arrows; and yet, it is a well known fact, that since the invention of gunpowder battles are not half so bloody as they were before that period. The opposite armies now seldom come to close quarters, a few rounds of musketry and artillery commonly decide the fate of the day; and had Mr. Gregory's improvement been carried into effect, still fewer rounds would have decided it than at present, and the carnage would consequently have been less.

When the rebellion broke out in 1715, the old gentleman went a second time to Holland, and returned when it was over to Aberdeen, where he died about 1720, aged 93, leaving behind him a history of his own time and country, which was never published.

Gregory (Dr. David), Savilian professor of astronomy at Oxford, whom Dr. Smith has termed subtilissimi ingenii mathematicus, was the eldest son of Mr. Gregory of Kinnairdy, brother of the abovementioned Mr. James Gregory. He was born at Aberdeen, in 1661, and received the earlier parts of his education in that city. He completed his studies at Edinburgh; and, being possessed of the mathematical papers of his uncle, soon distinguished himself likewise as the heir of his genius. In the 23d year of his age he was elected professor of mathematics in the university of Edinburgh; and published, in the same year, Exercitatio Geometrica de dimensione figurarum, sive specimen methodi generalis dimetiendi quasvis figuras, Edinburgh, 1684, 4to. He saw very early the excellence of the Newtonian philosophy; and had the merit of being the first who introduced it into the schools by his public lectures at Edinburgh. "He had (says Mr. Whiston) already caused several of his scholars to keep acts, as we call them, upon several branches of the Newtonian philosophy; while we, at Cambridge, poor wretches, were ignominiously studying the fictitious hypotheses of the Cartesian."

In 1691, on the report of Dr. Bernard's intention of resigning the Savilian professorship of astronomy at Oxford, David Gregory went to London; and being patronised by sir Isaac Newton, and warmly befriended by Mr. Flamstead, the astronomer royal, he obtained the vacant professorship, for which Dr. Halley was a competitor. This rivalship, however, instead of animosity, laid the foundation of friendship between these eminent men; and Halley soon after became the colleague of Gregory, by obtaining the professorship of geometry in the same university. Soon after his arrival in London, Mr. Gregory had been elected a fellow of the Royal Society; and, previously to his election into the Savilian professorship, had the degree of doctor of physic conferred on him by the university of Oxford.

In 1693, he published in the Philosophical Transactions a resolution of the Florentine problem de Testudine veliformi quadribili; and he continued to communicate to the public, from time to time, many ingenious mathematical papers by the same channel. In 1699 he printed at Oxford, Catoptricæ et Dioptricæ Sphæricæ Elementa; a work which, as he informs us in his preface, contains the substance of some of his public lectures read, eleven years before, at Edinburgh. This valuable treatise was republished first with additions by Dr. William Brown, with the recommendation of Mr. Jones, and Dr. Desaguliers; and afterwards by the latter of these gentlemen, with an appendix containing an account of the Gregorian and Newtonian telescopes, together with Mr. Hadley's tables for the construction of both those instruments. It is not unworthy of remark, that, in the end of this treatise, there is an observation which shows, that what is generally believed to be a discovery of a much later date, the construction of achromatic telescopes, which has been carried to great perfection by Mr. Dollond and Mr. Ramsden, had suggested itself to the mind of David Gregory, from the reflection on the admirable contrivance of nature, in combining the different humours of the eye. The passage is as follows: "Quod si ob difficultates physicas in speculis idoneis torno elaborandis et poliendis, etiamnum lentibus uti oporteat, fortassis media diversæ densitatis ad lentem objectivam componendam adhibere utile foret, ut a natura factum observamus in oculi fabrica, ubi cristallinus humor (fere ejusdem cum vitro virtutis ad radios lucis refringendos) aqueo et vitreo (aquæ quoad refractionem haud absimilibus) conjungitur, ad imaginem quam distincte fieri poterit, a natura nihil frustra moliente, in oculi fundo depingendam." Catopt. et Diopt. Sphær. Elem. Oxon. 1695, p. 98.

In 1702 our author published at Oxford, Astronomiæ Physicæ et Geometricæ Elementa; a work which is accounted his masterpiece. It is founded on the Newtonian doctrines, and was esteemed by sir Isaac Newton

himself as a most excellent explanation and defence of his philosophy. In the following year he gave to the world an edition in folio of the works of Euclid in Greek and Latin; in prosecution of a design of his predecessor Dr. Bernard, of printing the works of all the ancient mathematicians. In this work, although it contains all the treatises atrributed to Euclid, Dr. Gregory has been careful to point out such as he found reason, from internal evidence, to believe to be the productions of some inferior geometrician. In prosecution of Dr. Bernard's plan, Dr. Gregory engaged soon after, with his colleague Halley, in the publication of the Conics of Apollonius; but he had proceeded but a little way in this undertaking when he died, in the 49th year of his age, at Maidenhead in Berkshire, A. D. 1710. To the genius and abilities of David Gregory, the most celebrated mathematicians of the age, sir Isaac Newton, Dr. Halley, and Dr. Keill, have given ample testimonies. Besides those works published in his lifetime, he left in manuscript, A short Treatise of the Nature and Arithmetic of Logarithms, which is printed at the end of Dr. Keill's translation of Commandine's Euclid; and a Treatise of Practical Geometry, which was afterwards translated, and published in 1745, by Mr. Maclaurin.

Dr. David Gregory married in 1695 Elizabeth, the daughter of Mr. Oliphant of Langtown in Scotland. By this lady he had four sons, of whom, the eldest, David, was appointed regius professor of modern history at Oxford by king George I. and died in 1767, in an advanced age, after enjoying for many years the dignity of dean of Christ church in that university.

Dr. David Gregory was a most intimate and confidential friend of sir Isaac Newton, and was intrusted with a manuscript copy of the Principia, for the purpose of making observations on it. Of these Newton availed himself in the second edition, they having come too late for his first publication, which was exceedingly hurried by Dr. Halley, from fears that Newton's backwardness would not let it appear at all. There is a complete copy of these observations preserved in the library of the university of Edinburgh, presented to it by Dr. James Gregory, the present professor of the practice of medicine. These contain many sublime mathematical discussions, many valuable commentaries on the Principia, and many interesting anecdotes.

Gregory (Dr John), a celebrated physician, was the grandson of Mr. James Gregory above-mentioned; the time of his birth we have not been able to ascertain. He completed his studies in King's college, Aberdeen; and after attending lectures at Edinburgh, he went (in 1745) for the same purpose to Leyden: while here he received from Aberdeen an unsolicited degree in medicine. In 1747 he was elected professor of philosophy in the same university: this professorship he resigned in 1749, and directed his views entirely to the practice of physic, settling as a physician at Aberdeen. In 1752 he married Elizabeth daughter of William lord Forbes; and soon after removed to London, where he obtained much reputation in his profession. Here he published the Comparative View of the State and Faculties of Man, by which he was first known as an author. In 1755, on the death of his brother, he obtained the professorship of physic in King's college, Aberdeen: here he continued till 1766, when he obtained the professorial chair at Edinburgh. As a lecturer his manner was simple, natural, and animated. His lectures were delivered in great measure without notes; but he always expressed his ideas with uncommon perspicuity, and in a style happily attempered between the formality of studied composition and the ease of conversation. The only lectures which he committed fully to writing were those introductory discourses which he read at the beginning of his annual course, and which in 1770 were published under the title of Lectures on the Duties and Qualifications of a Physician. In the year 1772 Dr. Gregory published Elements of the Practice of Physic, for the use of students; a work intended solely for his own pupils, and to be used by himself as a text-book to be commented upon in his course of lectures. In an advertisement prefixed to this work, he signified his intention of comprehending in it the whole series of diseases of which he treated in his lectures on the practice of physic; but this intention he did not live to accomplish, having brought down the work no further than to the end of the class of febrile diseases.

Soon after the death of his wife, and, as he himself says, "for the amusement of his solitary hours," our author employed himself in the composition of that admirable tract, intitled, A Father's Legacy to his Daughters; a work which, though certainly never intended by its author for the public eye, it would have been an unwarrantable diminution of his fame, and a capricious refusal of a general benefit to mankind, to have limited to the sole purpose for which it was originally designed. These letters to his daughters were evidently written under the impression of an early death, which Dr. Gregory had reason to apprehend from a constitution subject to the gout, which had begun to show itself at irregular intervals even from the 18th year of his age. His mother, from whom he inherited that disease, died suddenly in 1770, while sitting at table; and Dr. Gregory had prognosticated for himself a similar death. The prediction, indeed, was too true; for having gone to bed on the ninth of February 1773, with no apparent disorder, he was found dead in the morning. His death had been instantaneous, and probably in his sleep; for there was not the smallest discomposure of limb or feature, a per ect Euthanasia. Some time after his death, the professorship of the Theory of Medicine was bestowed upon his eldest son, the present Dr. James Gregory; who has since succeeded to the practical chair of the late Dr. Cullen.

The celebrated Dr. Reid, author of what is

commonly called the *Common sense* system of Metaphysics, was a nephew of Dr. David Gregory of Oxford, and inherited the mathematical genius of the family, as is evident from his truly valuable Disquisition on Quantity, published in vol. 45. of the Philosophical Transactions of London.

It may farther be observed of this extraordinary family, that Dr. James Gregory, the present learned professor of physic and medicine in the university of Edinburgh, is the son of the late Dr. John Gregory; the said James has lately published a most ingenious work, intitled, Philosophical and Literary Essays, in 2 volumes 8vo. Edinb. 1792; and he seems to be another worthy inheritor of the singular genius of his family.

There have also been some very able authors of the same name in England: as the late Dr. George Gregory of West Ham, and others; but whether they trace up their origin to the same family, or whether they apprehend they have not talent sufficient to keep up the family credit, supposing they should attempt it, are points into which we cannot here enquire.

GREGORY (St. Vincent), a very respectable Flemish geometrician, was born at Bruges in 1584, and became a Jesuit at Rome at 20 years of age. He studied mathematics under the learned Jesuit Clavius. He afterward became a reputable professor of those sciences himself, and his instructions were solicited by several princes: he was called to Prague by the emperor Ferdinand the Second; and Philip the Fourth, king of Spain, was desirous of having him to teach mathematics to his son the young prince John of Austria. He was not less estimable for his virtues than his skill in the sciences. His well-meant endeavours were very commendable, when his holy zeal, though for a false religion, led him to follow the army in Flanders one campaign, to confess the wounded and dying soldiers, in which he received several wounds himself. He died of an apoplexy at Ghent, in 1667, at 83 years of age. As a writer, Gregory St. Vincent was very diffuse and voluminous, but he was an excellent geometrician. He published, in Latin, three mathematical works, the principal of which was his Opus Geometricum Quadraturæ Circuli, et Sectionum Coni, Antwerp, 1647, 2 vols. folio.

GRE-HOUND. See CANIS and GREYHOUND.

GREIN, a town of the archduchy of Austria, situate on the Danube. Lat. 48. 16 N. Lon. 18. 5 E.

GRE'MIAL. *a.* (*gremium*, Latin.) Pertaining to the lap.

GREN (Frederick Albrecht Charles), an eminent German chemist, was born at Bernberg, May 1st, 1760. We have not been able to obtain any information respecting the place and manner of his education: but we find that he soon attained great celebrity, and that at a very early period he became editor of the Journal der Physik, or Journal of Natural Philosophy, a work which commenced in 1770. At [illegible] his reputation became so completely established that he was chosen Public Professor of Medicine, and Member of the Society of the Searchers into Nature, at Halle. Among his works are: Observations on Fermentations and the Products thence obtained, 8vo. Systematic Manual of Chemistry, 2 vols. 8vo. Principles of Natural Knowledge, 8vo. Observationes et Experimenta circa Genesin Aëris fixi et phlogisticati, 8vo. Principles of Pharmacology and the Materia Medica, two parts. He was the contributor also to the Allgemein-Literatur-Zeitung of Jena, and author of various papers in Crell's Chemical Annals. This very able philosopher died Nov. 26, 1798, in his 39th year.

GRENADA. See GRANADA.

GRENADE. See GRANADO.

GRENADIER. See GRANADIER.

GRENADILLOES. See GRANADILLOES.

GRENAILLE, a name given by the French writers to a preparation of copper, which the Chinese use as a red colour in some of their finest china, particularly for that colour which is called oil-red, or red in oil.

GRENOBLE, an ancient town of France, in the department of Isere, with a bishop's see. It contains many handsome structures, particularly churches. The cathedral is a fine ancient building. Lat. 45. 12 N. Lon. 5. 49 E.

GRESHAM (Sir Thomas), descended from an ancient family in Norfolk, was born in 1519 at London. He was bred to trade, but was some time at Caius college, Cambridge. He amassed a large fortune, being successively agent to king Edward VI. queen Mary, and queen Elizabeth, for their money and mercantile transactions. He built the Royal Exchange at his own expence; founded a college in Bishopsgate-street for lectures in divinity, law, physic, astronomy, geometry, music, and rhetoric, besides endowing many public charities. He died suddenly in his own house in 1579. He was buried in a sumptuous manner in the church of St. Helen's, Bishopsgate-street.

GRESSORIAL, in ornithology, a term applied to the feet of birds formed for walking, having three toes forward and one behind.

GRETNA, a village in Dumfriesshire, near the mouth of the Esk, and on the borders of Cumberland, nine miles N.W. of Carlisle. Being out of the jurisdiction of the marriage act, it has been long noted as the resort of young people in England, who choose to be married notwithstanding the prohibitions of their parents and guardians, or in opposition to the ecclesiastical laws of England, as they relate to consanguinity.

GREVILLE (Fulk or Foulk), lord Brooke, a patron of letters and an ingenious writer, was the eldest son of sir Fulk Greville, of Beauchamp-court, in Warwickshire, where he was born in 1554. He was in great favour with queen Elizabeth, and was created lord Brooke of Beauchamp-court by king James, who also made him a grant of Warwick castle. He founded a history-lecture in the university of Cambridge. This accomplished nobleman

was killed by a domestic whom he had severely reproved for an insolent expostulation on the subject of a neglect which the man attributed to his lordship. This happened in 1628.

GREVIN (James), a French poet and physician, was born in 1538. He was in the service of Margaret of France, duchess of Savoy, and died at Turin at the age of 32. There are three plays extant of his, and he had a share in writing the ingenious poem entitled The Temple, aimed at Ronsard, who had abused the Calvinists.

GREW. The preterit of *grow*.

GREW (Nehemiah), a learned English writer, in the 17th century, had a considerable practice as a physician in London, and succeeded Mr. Oldenburgh in the office of secretary to the Royal Society. In this capacity, pursuant to an order of council, he drew up a catalogue of the natural and artificial rarities belonging to the society, under the title of Musæum Regalis Societatis, &c. 1681. He also wrote, besides several pieces in the Philosophical Transactions, 1. The Comparative Anatomy of the Stomach and Guts, folio. 2. The Anatomy of Plants, folio. 3. Tractatus de salis cathartici natura et usu. 4. Cosmologia Sacra, or a Discourse of the Universe as it is the Creature and Kingdom of God, folio. He died suddenly in 1721.

GREWIA, in botany, a genus of the class polyandria, order monogynia. Calyx five-leaved; petals with a nectariferous scale at the base of each; drupe four-lobed, four-celled, with a one or two-seeded nut. Eleven species: chiefly natives of Africa and Asia. Of these the most common is G. occidentalis, with roundish-ovate, obtuse, toothed, glabrous leaves; solitary, one-flowered peduncles: a native of the Cape, the varieties of which are either shrubs or trees of a near resemblance to the elm.

GREY, a colour. See GRAY.

GREY (Lady Jane), an illustrious lady, was of the blood royal of England by both parents. She was born in 1537, at Broadgate, her father's seat in Leicestershire. She was one of the most accomplished and learned women of her age, and one of the most unfortunate. Her father, the duke of Suffolk, and her father-in-law, the duke of Northumberland, caused her to be proclaimed queen, on the death of Edward VI. for which, on the prevalence of queen Mary's party, she and her husband lord Guildford Dudley, with others, were sentenced to die. She was beheaded on Tower-hill in 1554. Her husband, lord Guildford Dudley, was beheaded on the same spot about an hour before, lady Jane having seen him pass by her apartments in the Tower, and beheld his body conveyed back, wrapped up in a linen cloth. On the evening previous to her death, she wrote a letter in the Greek language to her sister, lady Catharine Grey. She had written a letter a few days before to her father to reconcile him to her fate, and in every respect she conducted herself with the most perfect fortitude and the most refined sensibility.

Her writings are, 1. Four Latin Epistles; three to Bullenger, and one to her sister lady Catharine. The last was written, the night before her execution, in a blank leaf of a Greek testament. Printed in a book intitled Epistolæ Helveticæ Reformatoribus, vel ad eos scriptæ, &c. Tiguri, 1742, 8vo. 2. Her Conference with Fleckenham. (Ballard.) 3. A letter to Dr. Harding, her father's chaplain. Printed in the Phœnix, vol. ii. p. 28. 4. A Prayer for her own use during her confinement. In Fox's Acts and Monuments. 5. Four Latin verses; written in prison with a pin. They are as follows:

Non aliena putes, homini quæ obtingere possunt:
Sors hodierna mihi, tunc erit illa tibi.
Jane Dudley.

Deo juvante, nil nocet livor malus:
Et non juvante, nil juvat labor gravis.
Post tenebras spero lucem.

6. Her Speech on the Scaffold. (Ballard.) It began thus: "My lords, and you good Christian people who come to see me die; I am under a law, and by that law, as a never-erring judge, I am condemned to die: not for any thing I have offended the queen's majesty; for I will wash my hands guiltless thereof, and deliver to my God a soul as pure from such trespass as innocence from injustice; but only for that I consented to the thing I was enforced unto, constraint making the law believe I did that which I never understood," &c.—Hollinshed, sir Richard Baker, Bale, and Fox, tell us that she wrote several other things, but do not mention where they are to be found.

GREYHOUND, a variety of the canis familiaris, employed in the field-sport called coursing. (See CANIS and COURSING.) It is at present an undecided point among sportsmen, whether greyhounds should be left wild to their own native powers till of age for the field, or should be regularly trained from a few months old. It seems generally agreed, however, that the best and even the handsomest greyhounds proceed from the most uncouthly formed pups. The age at which they are supposed to have attained their full powers for coursing is when two years old: and to be perfect in form, they should then, in the language of an old but well-turned hexastick, possess a

Head like a snake,
Neck like a drake,
Back like a beam,
Side like a bream,
Tail like a rat,
And foot like a cat.

For the rest, see CANIS.

GRIAS. Anchovy pear. In botany, a genus of the class polyandria, order monogynia. Calyx four-cleft; petals four; stigma sessile, hollowed out cross-wise; drupe with an eight-grooved shell. One species; a Jamaica tree fifty feet high; leaves pendulous, very long

wedge-shaped at the base; peduncles many-flowered; fruit pear-shaped, and esculent.

GRICE. *s.* 1. A little pig (*Gouldman*). 2. A step or *greeze* (*Shakspeare*).

To GRIDE. *v. n.* (*gridare*, Italian.) To cut; to make way by cutting (*Milton*).

GRI'DELIN. *s.* A colour mixed of white and red (*Dryden*).

GRI'DIRON. *s.* (*grind*, Islandick, a grate, and *iron*.) A portable grate on which meat is laid to be broiled upon the fire (*Spectator*).

GRIEF. *s.* (from *grieve*.) Is sometimes considered as synonymous with sorrow; and in this case we speak of the transports of grief. At other times it expresses a more silent, deep, and painful affection, such as is inspired by domestic calamities; particularly by the loss of friends and relatives; or by the distress either of body or mind, experienced by those we love and value.

In grief the sensation experienced is not wholly painful: there is, if we may so speak, a kind of delight derived from contemplating the cause of the affliction; from enumerating all the excellencies and advantages, real or imaginary, of that which was once possessed, or might have been possessed, and fondly dwelling upon each. Thus the original emotion subsides into a permanent affection. Shakspeare gives us a fine example of this, when depicting the grief of a mother for the loss of a child, in The Life and Death of King John. He first describes her ravings.

"I am not mad; this hair I tear, is mine;
My name is Constance, I was Geffrey's wife:
Young Arthur is my son, and he is lost:
I am not mad—I would to heaven I were!
For then 'tis like I should forget myself:
O, if I could, what grief should I forget!
Preach some philosophy to make me mad,
And thou shalt be canoniz'd, cardinal;
For being not mad, but sensible of grief,
My reasonable part produces reason
How I may be delivered of these woes,
And teaches me to kill or hang myself.
If I were mad, I should forget my son,
Or madly think, a babe of clouts were he:
I am not mad; too well, too well I feel,
The diff'rent plague of each calamity."

The manner in which these emotions sink into a permanent affection, is thus touched:

"*Const.* Father cardinal, I have heard you say,
That we shall see and know our friends in heaven:
If that be true, I shall see my boy again;
For, since the birth of Cain, the first male-child,
To him that did but yesterday suspire,
There was not such a gracious creature born.
But now will canker sorrow eat my bud,
And chase the native beauty from his cheek,
And he will look as hollow as a ghost;
As dim and meagre as an ague's fit;
And so he'll die; and rising so again,
When I shall meet him in the court of heaven,
I shall not know him; therefore, never, never,
Must I behold my pretty Arthur more.
Pand. You hold too heinous a respect of grief.
Const. He talks to me that never had a son.
K. Phil. You are as fond of grief, as of your child.
Const. Grief fills the room up of my absent child,
Lies in his bed, walks up and down with me,
Puts on his pretty looks, repeats his words,
Remembers me of all his gracious parts,
Stuffs out his vacant garments with his form;
Then have I reason to be fond of grief."

Shakspeare also pourtrays in a most striking manner, in his play of Macbeth, the powerful inward operation of grief, on receiving unexpectedly the news of a heavy calamity. Macduff, while at the English court, is told by Rosse of the murder of his wife and children by order of Macbeth.

Rosse. Your castle is surpris'd; your wife, and babes,
Savagely slaughter'd: to relate the manner,
Were, on the quarry of these murder'd deer
To add the death of you.
Malcolm. Merciful heaven!——
What, man! ne'er pull your hat upon your brows;
Give sorrow words: the grief that does not speak,
Whispers the o'er-fraught heart, and bids it break.
Macduff. My children too?
Rosse. Wife, children, servants, all
That could be found.
Macduff. And I must be from thence!
My wife kill'd too?
Rosse. I have said.
Malcolm. Be comforted:
Let's make us med'cines of our great revenge,
To cure his deadly grief.
Macduff. He has no children.—All my pretty ones?
Did you say all?—Oh, hell-kite! all!
What all my pretty chickens, and their dam,
At one fell swoop?
Malcolm. Dispute it like a man.
Macduff. I shall do so;
But I must also feel it as a man:
I cannot but remember such things were,
That were most precious to me.
Macbeth, Act 4.

GRIELUM. In botany, a genus of the class decandria, order pentagynia. Calyx five-cleft; petals five; filaments permanent; pericarps five, one-seeded. One species: a shrub of Ethiopia, with hairy, villous, alternate leaves.

GRIERSON (Constantia), a woman of ex-

traordinary attainments, was descended of very poor and illiterate parents in the county of Kilkenny, in Ireland. She was well acquainted with Greek and Roman literature, and published editions of Tacitus and Terence. She addressed a Greek epigram to the son of lord Carteret, which nobleman procured her husband a patent to be the king's printer in Ireland; and, as a mark of distinction, caused her life to be inserted in it. She died in 1733, at the age of 27.

GRIE'VANCE. *s.* (from *grief.*) 1. A state of uneasiness (*South*). 2. The cause of uneasiness (*Swift*).

To GRIEVE. *v. a.* (*grever*, French.) 1. To afflict; to hurt. 2. To make sorrowful.

To GRIEVE. *v. n.* To be in pain for something past; to mourn; to sorrow, as for the death of friends (*Shakspeare. Dryden*).

GRIE'VINGLY. *ad.* (from *grieve.*) In sorrow: sorrowfully (*Shakspeare*).

GRIE'VOUS. *a.* (*gravis*, Latin.) 1. Afflictive; painful; hard to be born (*Hooker*). 2. Such as causes sorrow (*Watts*). 3. Expressing a great degree of uneasiness (*Shakspeare*). 4. Atrocious; heavy (*Shakspeare*).

GRIE'VOUSLY. *ad.* 1. Painfully; with pain (*Spenser*). 2. With discontent; with ill-will (*Knolles*). 3. Calamitously; miserably (*Hooker*). 4. Vexatiously (*Ray*).

GRIE'VOUSNESS. *s.* (from *grievous.*) Sorrow; pain; calamity (*Isaiah*).

GRIFFENHAKEN, a town of Prussian Pomerania, in the duchy of Stetin, seated on the Oder. Lat. 53. 25 N. Lon. 14. 42 E.

GRIFFON, GRYPHUS, γρυψ, in the natural history of the ancients, the name of an imaginary bird of prey, of the eagle kind. They represented it with four legs, wings, and a beak; the upper part representing an eagle, and the lower a lion; they supposed it to watch over gold mines, hidden treasures, &c. This animal was consecrated to the sun; and the ancient painters represented the chariot of the sun as drawn by griffons. M. Spanheim observes the same of those of Jupiter and Nemesis. The griffon in Scripture is that species of the eagle called in Latin *ossifraga*, the osprey; and פרס, of the verb פרס, *parus*, to break. The griffon is frequently seen on ancient medals: and is still borne in coat-armour. Guillim blazons it rampant; alleging, that any very fierce animal may be so blazoned as well as the lion. Sylvester, Morgan, and others, use the terms segreiant instead of rampant. The griffon is also an ornament of architecture in constant use among the Greeks, and was copied from them, with other elegancies of architectural enrichments, by the Romans. See SPHYNX.

GRIG. *s.* (*kricke*, Bavarian, a little duck.) 1. A small eel. 2. A merry creature (*Swift*).

To GRILL. *v. n.* (*grille*, a grate, French.) To broil on a gridiron.

GRI'LLADE. *s.* (from *grill.*) Any thing broiled on the gridiron.

To GRI'LLY. *v. a.* (from *grill.*) To harass; to hurt (*Hudibras*).

GRIM. *a.* (ȝrimma, Saxon.) 1. Having a countenance of terrour; horrible; hideous; frightful (*Denham*). 2. Ugly; ill-looking (*Shakspeare*).

GRI'MACE. *s.* (French; from *grim.*) 1. A distortion of the countenance from habit, affectation, or insolence (*South*). 2. Air of affectation (*Granville*).

GRIMALDI (John Francis), surnamed the Bolognese, was born at Bologna in 1606, and studied under the Caracci. He was employed by Innocent X. in painting the Vatican, and by cardinal Mazarin in adorning his own palace and the Louvre. He also understood architecture and engraving. He was of an amiable and generous disposition. He died at Rome in 1680.

GRIMA'LKIN. *s.* (*gris*, gray, and *malkin.*) The name of an old cat (*Philips*).

GRIMBERGEN, a town of Austrian Brabant, with an abbey and a castle. Lat. 50. 57 N. Lon. 4. 27 E.

GRIME. *s.* (from *grim.*) Dirt deeply insinuated (*Woodward*).

To GRIME. *v. a.* (from the noun.) To dirt; to sully deeply (*Shakspeare*).

GRI'MLY. *ad.* (from *grim.*) 1. Horribly; hideously (*Shakspeare*). 2. Sourly; sullenly (*Shakspeare*).

GRIMM, a town in the electorate of Saxony, with a citadel, seated on the Muldaw. Lat. 51. 15 N. Lon. 12. 35 E.

GRI'MNESS. *s.* (from *grim.*) Horrour; frightfulness of visage.

GRIMNIA. In botany, a genus of the class cryptogamia, order musci. Capsule ovate; fringe simple, of sixteen undivided teeth; veil campanulate, inflated, lax. Six species: all indigenous to our own country, as well as to other parts of Europe.

GRIMSBY (Great), a large borough in Lincolnshire, with a market on Wednesdays and Saturdays. It has now only one church, a large handsome structure, like a cathedral. The harbour is now almost choaked up. Lat. 53. 34 N. Lon. 0. 6 E.

To GRIN. *v. n.* (ȝrennian, Saxon.) 1. To set the teeth together and withdraw the lips (*Shakspeare*). 2. To fix the teeth as in anguish (*Shakspeare*).

GRIN. *s.* (from the verb.) The act of closing the teeth and showing them (*Watts*).

GRIN. *s.* (ȝryn, Saxon.) A snare; a trap (*Job*).

To GRIND. *v. a.* preter. *I ground*; part. pass. *ground*. (ȝrindan, Saxon.) 1. To reduce any thing to powder by friction; to comminute by attrition (*Bent.*). 2. To sharpen or smooth by rubbing on something hard (*Herbert*). 3. To rub one against another (*Bacon*). 4. To harass; to oppress (*Addison*).

To GRIND. *v. n.* 1. To perform the act of grinding (*Milton*). 2. To be moved as in the act of grinding.

GRINDELWALD, a town of Swisserland, in the canton of Bern. Lat. 46. 27 N. Lon. 7. 43 E.

GRI'NDER. *s.* (from *grind.*) 1. One that

grinds. 2. The instrument of grinding (*Sandys*). 3. The back tooth (*Bacon*).

GRINDERS, in anatomy. See TEETH.

GRINDING, the reducing hard substances to fine powders, either by the mortar, or by way of levigation upon a marble.

GRINDING, in cutlery, is the operation by which edge tools are sharpened. As commonly practised, such grinding is attended with great inconveniency arising from the developement of heat by friction. The fact of sparks flying from a dry grindstone when a piece of iron or steel is applied to its surface during the rotation, has been seen by every one. The heat produced during this process is such that the steel very soon becomes ignited, and hard tools are very frequently softened and spoiled, for want of care during the grinding. When a cylindrical stone is partly immersed in a trough of water, the rotation must be moderate and the work slow, otherwise the water would soon be thrown off by the centrifugal force; and when this fluid is applied by a cock from above, the quantity is too small to preserve the requisite low temperature. It is even found, that the point of a hard tool, ground under a considerable mass of water, will be softened, if it be not held so as to meet the stream; sparks being frequently afforded even under the water.

To find a remedy for this, Mr. Nicholson was led, by some accounts which he received of German cutlery, to make the following experiment. He procured a Newcastle grindstone of a fine grit and ten inches in diameter, and also a block of mahogany to be used with emery on its face. Both the stone and the wooden block were mounted on an axis, to be occasionally applied between the centres of a strong lathe. In this situation both were turned truly cylindrical, and of the same diameter. The face of the wood was grooved obliquely in opposite directions, to afford a lodgment for the emery. The face of the stone was left smooth, and there was a trough of proper size applied beneath the stone to hold water. The grindstone was then used with water, and the wooden cylinder was faced with emery and oil. The instrument ground was a file, out of which it was proposed to grind all the teeth. The rotation was produced by the mechanism of the lathe; the velocity being such as to turn the grinding apparatus about five revolutions in a second. The stone operated but slowly, and the water from the trough was soon exhausted, with inconvenience to the workman, who could scarcely be defended from it but by slackening the velocity. The emery cylinder cut rather faster. But notwithstanding the friction was made to operate successively and by quick changes on the whole surface of the file, it soon became too much heated to be held with any convenience; and when a cloth was used to defend the hand, the work not only became awkward, but the heat increased to such a degree that the oil began to be decomposed, and emitted an empyreumatic smell. The stone was then suffered to dry, and the file tried upon its face. It almost immediately became blue, and soon afterwards red-hot. Both the cylinders were then covered with tallow, by applying the end of a candle to each while revolving, and emery was sprinkled upon the cylinder of wood. The same tool was then applied to the grindstone in rapid motion. At the first instant the friction was scarcely perceptible; but very speedily afterwards the zone of tallow pressed by the tool became fused, and the stone cut very fast. The tool was scarcely at all heated for a long time; and when it began to feel warm its temperature was immediately lowered by removing it to a new zone of the cylinder. The same effect took place when the experiment was repeated with the wooden cylinder.

GRI'NDLESTONE. GRI'NDSTONE. *s.* (from *grind* and *stone*.) The stone on which edged instruments are sharpened.

GRINDSTONE, in oryctology. See ARENARIUS.

GRINDON-RIGG, a river in Northumberland, near Berwick, famous for the victory which was gained over the Scots in 1558 by the earl of Northumberland and his brother, when many of the Scots were drowned in this river.

GRI'NNER. *s.* (from *grin*.) He that grins (*Addison*).

GRI'NNINGLY. *ad.* (from *grin*.) With a grinning laugh.

GRINSTEAD (East), a borough in Sussex, with a market on Thursdays. The assizes are sometimes held here. Lat. 51. 12 N. Lon. 0. 2 E.

GRIP. *s.* A small ditch (*Ainsworth*).

To GRIPE. *v. a.* (*griepan*, Gothic.) 1. To hold with the fingers closed (*Drayton*). 2. To hold hard (*Dryden*). 3. (*gripper*, Fr.) To catch eagerly; to seize (*Shakspeare*).) 4. To close; to clutch (*Pope*). 5. To pinch; to press; to squeeze (*Dryden*). 6. To give a pain in the bowels (*Dryden*).

To GRIPE. *v. n.* 1. To feel the colic (*Locke*). 2. To pinch; to catch at money meanly (*Fell*).

GRIPE. *s.* (from the verb.) 1. Grasp; hold; seizure of the hand or paw. 2. Squeeze; pressure *Dryden*). 3. Oppression; crushing power (*Shakspeare*). 4. Affliction; pinching distress (*Otway*). 5. (In the plural.) Belly-ache; colic (*Floyer*).

GRIPE, in the sea-language, is a piece of timber fayed against the lower piece of the stern, from the fore-mast end of the keel, joining with the knee of the head: its use is to defend the lower part of the stern from any injury; but it is often made the larger, to make the ship keep a good wind.

GRIPE is also a sea-term, for a ship's turning her head more to the wind than she should: this is caused either by over-loading her a-head, the weight of which presses her down, so that she will not readily fall off from the wind; or by staying or setting her masts too much aft; which is always a fault in short ships that draw much water, since it causes them to be continually running into the wind: though in float-

ing ships, if the masts be not stayed very far aft, they will never keep a good wind.

GRI'PER. *s.* (from *gripe.*) Oppressor; usurer; extortioner (*Burton*).

GRI'PINGLY. *ad.* (from *griping.*) With pain in the guts (*Bacon*).

GRI'PLE. *s.* A griping miser (*Spenser*).

GRIPSWALD. a strong town of Swedish Pomerania, formerly imperial, with a good harbour, and a university. Lat. 54. 4 N. Lon. 13. 44 E.

GRI'SAMBER. *s.* Ambergrise (*Milton*).

GRI'SE. *s.* A step, or scale of steps (*Shakspeare*).

GRISGRIS, a superstition greatly prevalent among the negroes in the interior parts of Africa. The grisgris are certain eastern characters mixed with magical figures drawn by the Marabuts, or priests, upon paper. The words are probably of the Mandingo language, though the characters are an attempt to imitate the Arabic. The poorest negro never goes to war without his grisgris, as a charm against wounds; and if it proves ineffectual, the priest transfers the blame on the immorality of his conduct. These priests invent grisgris against all kinds of dangers, and in favour of all desires and appetites; by virtue of which the possessors may obtain or avoid whatever they like or dislike. They defend them from storms, enemies, diseases, pains, and misfortunes; and preserve health, long life, wealth, honour, and merit, according to the Marabuts. No clergy in the world are more honoured and revered by the people than these impostors are by the negroes; nor are any people in the world more impoverished by their priests than these negroes are, a grisgris being frequently sold at three slaves and four and five oxen. The grisgris intended for the head is made in the form of a cross, reaching from the forehead to the neck behind, and from ear to ear; nor are the arms and shoulders neglected.

GRI'SKIN. *s.* (*grisgin*, roast meat, Irish.) The vertebres of a hog broiled.

GRISLEA. In botany, a genus of the class octandria, order monogynia. Calyx four-cleft; petals four, from the incissures of the calyx; filaments very long, ascending; capsule globular, superior, one-celled, many seeded. Two species:

1. G. secunda: with petioled, glabrous leaves: and axillary corymbs pointing one way. A tree of South America, with leaves like the bay.

2. G. tomentosa. An East Indian shrub, with lanceolate leaves, and red calyx.

GRI'SLY. *a.* (ʒꞃıꞅlı, Saxon.) Dreadful; horrible; hideous; frightful (*Addison*).

GRISONS, a people in alliance with the Swiss, divided into three leagues, which form one republic. The country which they inhabit is bounded on the north by the canton of Glaris, and the counties of Sargans and Pludeatz, on the east by the Tyrolese, on the south by the states of Venice and the duchy of Milan, and on the west by the Swiss Italian bailiwicks, and the canton of Uri. The whole country was known to the ancients by the name of Rhœtia. Under this name likewise was comprised a part of Swabia, and was distinguished into Upper and Lower Rhœtia. This country was what constituted Upper Rhœtia; and, at the decline of the Roman empire, fell under the power of the Ostrogoths, who governed it by dukes. Towards the sixth century, it passed under the dominion of the Franks, and in the ninth was united to Germany. The leagues, or alliances, were originally formed on account of the tyranny of the great barons. The most ancient began about the year 1400, and in 1419, in the bishopric of Coire, against the secular power of the bishop, and took the name of The Caddee, or League of God's House. The second was formed in the year 1424, and was called the Grise, or Gray League. The other was formed in the year 1436, which is the League of the Ten Jurisdictions. The two former entered into an alliance in the year 1425, and was joined by the last in the year 1471. This general confederation was renewed in the year 1544, and again in 1712. By this treaty of union, these people reciprocally engage not to make any new alliance, nor declare war, nor make peace, but by common consent. They agree to succour each other at their own expence, guarantee each other's privileges, &c. Their government is perfectly democratic, subdivided into a great number of small democracies totally independent of each other in their particular police. A diet, or assembly of the three leagues, is held yearly, composed of sixty-three deputies, and three chiefs, of which each league sends its respective share. In the election of these deputies, every male of sixteen years of age has a voice, and in some communities they are allowed to vote at the age of fourteen. The country is, in general, very elevated and mountainous; it contains several valleys, to some of which the passages are shut up during great part of the year. Towards the south lie the chief of these valleys, sunk in the Alps, which at last terminate in inaccessible glaciers, or elevated rocks, capable of affording no kind of vegetable whatever. From these glaciers the principal rivers take their source; as the Rhine, the Inn, and the Adda. The inhabitants cultivate some grain in the valleys, and the less steep hills, but not sufficient for the wants of half the people; the rest they obtain from Lombardy. Their principal object, as farmers, is the care of their sheep and cattle, from which they obtain excellent butter and cheese. The mountains afford good pasture, the valleys produce fruit, and the hills chesnuts. The principal part of the mountains abound in metals, minerals, fossils, and mineral springs; salt is obtained from Tyrol; most of the Grison peasants wear woollen and linen cloth of their own manufacture. The number of inhabitants of the Three Leagues is estimated at 150,000 souls; and of their subject countries, the Valteline, Bormio, and Chiavenna, is 100,000. The inhabitants are partly Roman Catholics, and partly Protestants; the peasants

speak a corrupt Italian, but the German language is chiefly made use of in the towns, and in all public acts.

GRIST. *s.* (ᵹꞃıꞅꞇ, Saxon.) 1. Corn to be ground (*Tusser.*) 2. Supply; provision (*Swift*).

GRI'STLE. *s.* (ᵹꞃıꞅꞇle, Sax.) A cartilage (*Ray*).

GRI'STLY. *a.* (from *gristle.*) Cartilaginous; made of gristle (*Harvey*).

GRIT. *s.* (ᵹꞃyꞇꞇa, Saxon.) 1. The coarse part of meal. 2. Oats husked, or coarsely ground. 3. Sand; rough hard particles. (*Philips*).

GRIT, in oryctology. See ARENA.

GRI'TTINESS. *s.* (from *gritty.*) Sandiness; the quality of abounding in grit (*Mortimer*).

GRI'TTY. *a.* (from *grit.*) Full of hard particles; consisting of grit (*Newton*).

GRI'ZELIN. *s.* (more properly *gridelin.*) A pale red colour (*Temple*).

GRI'ZZLE. *s.* (from *gris*, gray; *grisaille*, Fr.) A mixture of white and black; gray (*Shakspeare*).

GRI'ZZLED. *a.* (from *grizzle.*) Interspersed with gray (*Dryden*).

GRI'ZZLY. *a.* (from *gris*, gray, French.) Somewhat gray (*Bacon*).

To GROAN. *v. n.* (ᵹꞃanan, Sax.) To breathe with a hoarse noise, as in pain or agony (*Pope*).

GROAN. *s.* (from the verb.) 1. Breath expired with noise and difficulty. 2. Any hoarse dead sound (*Shakspeare*).

GRO'ANFUL. *a.* (*groan* and *full.*) Sad; agonizing: not used (*Spensere*).

GROAT. *s.* (*groot*, Dutch.) 1. A piece valued at four-pence. 2. A proverbial name for a small sum (*Swift.*) 3. GROATS. Oats that have the hulls taken off (*Ainsworth*).

GRO'CER. *s.* (from *gross*, a large quantity.) A man who buys and sells tea, sugar, and plums, and spices for gain (*Watts*).

GROCER'S COMPANY, See COMPANY.

GRO'CERY. *s.* (from *grocer.*) Grocers ware, such as tea, sugar, spice (*Clarendon*).

GRODNO, the principal town, though not the capital, of Lithuania. It is a large and straggling place, but contains no more than three hundred Christians, excluding the persons employed in the manufactures, and one thousand Jews. It has greatly the appearance of a decayed town; containing a mixture of wretched hovels, falling houses, and ruined palaces, with magnificent gateways, remains of its ancient splendour. A few habitations in good repair make the contrast more striking. Some remains still exist of the old palace in which the kings used to reside during the holding of the diets. Here is a college, and a physic garden. Grodno is now subject to Russia. It is seated on the river Niemen. Lat. 53. 23 N. Lon. 24. 15 E.

GRO'GERAM. GRO'GRAM. GRO'GRAN. *s.* (*gros grain*, French.) Stuff woven with a large woof and a rough pile.

GROGGINESS, in the manage, a stiffness produced in the foot of a horse, by its having been long battered on hard ground. Swelling of the legs and stiffness of the sinews generally follow. A horse bearing entirely upon his heels in a trot, is styled groggy; and this defect is seldom curable.

GROIN, that part of the belly next the thigh. (See INGUEN.) In vol. 67 of the Philosophical Transactions is an account of a remarkable case, where a peg of wood was extracted from the groin of a young woman of twenty-one, after it had remained sixteen years in the stomach and intestines, having been accidentally swallowed when she was about five years of age.

GROIN, among builders, is the angular curve made by the intersection of two semicylinders, or arches, and is either regular or irregular. A regular groin is when the intersecting arches, whether semicircular or semielliptical, are of the same diameters and heights. An irregular groin is where one of the arches is semicircular and the other semielliptical.

GROMWELL, in botany. See LITHASPERMUM.

GRONINGEN, one of Seven United Provinces, bounded on the E. by the river Embs, which separates it from East Friesland, on the W. by Friesland, on the N. by the German ocean, and on the S. by Overyssel. It is divided into two parts, of which the town of Groningen and its district are one, and the Ommerlands the other. These two bodies assembled by their deputies, with the states of the province, make the sovereignty. The chief town is of the same name. It is rich, populous, and handsome. It is seated on the rivers Hunes and Aa, and has a university. Lat. 53. 10 N. Lon. 6. 31 E.

GRONOVIA. In botany, a genus of the class pentandria, order monogynia. Petals five, and with the stamens inserted into the campanulate calyx: berry dry, one-seeded inferior: one species; a plant of Vera Cruz, climbing by the tendrils; leaves stinging; flowers small.

GRONOVIUS (John Frederick), an illustrious civilian, historian, and critic, was born at Hamburgh in 1613. After travelling through Germany, Italy, and France, he was made professor of polite learning at Daventer, and afterwards at Leyden, where he died in 1672.

GRONOVIUS (James), son of the preceding, was born in 1645, at Daventer. He made a tour to England in 1670, where he acquired the friendship of several learned men. He was professor at Pisa, and afterwards at Leyden, where he died in 1716. He was editor of many of the classics, but his chief work is, Thesaurus Antiquatum Græcarum, 13 vols. folio.

GROOM. *s.* (*grom*, Dutch.) 1. A boy; a waiter; a servant (*Spenser*). 2. A young man (*Fairfax*). 3. A man newly married (*Dryden*).

GROOM, in the manage, a servant hired

to take care of horses, and who professes a thorough knowledge of this business. This knowledge, though seldom sufficiently possessed, is the first requisite in making choice of such a person: the accessories should be obedience, fidelity, great cleanliness and neatness, patience, diligence, and good temper.

GROOVE. *s.* (from *grave.*) 1. A deep cavern, or hollow in mines (*Boyle*). 2. A channel or hollow cut with a tool (*Mox.*).

To GROOVE. *v. a.* (from the noun.) To cut hollow (*Swift*).

To GROPE. *v. n.* (ȝnapan, Saxon.) To feel where one cannot see (*Sandys*).

To GROPE. *v. a.* To search by feeling in the dark (*Swift*).

GRO'PER. *s.* (from *grope.*) One that searches in the dark.

GROSBEAK, in ornithology. See LOXIA.

GROSE (Francis), an eminent English antiquary. He illustrated the Antiquities of England and Wales, in 4 vols. and of Scotland, in 2 vols. He was executing a work of the same kind relative to Ireland, when he died at Dublin, in 1791, at the age of 52. He was an ingenious and pleasant writer, and a remarkably good natured and facetious man. His works are as follow:

1. The Antiquities of England and Wales, 8 vols. 4to and 8vo. 2. The Antiquities of Scotland, 2 vols. 4to and 8vo. 3. The Antiquities of Ireland, 2 vols. 4to and 8vo. 4. A Treatise on ancient Armour and Weapons, 4to, 1785. 5. A Classical Dictionary of the Vulgar Tongue, 8vo. 1785. 6. Military Antiquities; being a History of the English Army from the Conquest to the present Time, 2 vols. 4to, 1786, 1788. 7. The History of Dover Castle, by the Rev. William Danell, 4to, 1786. 8. A Provincial Glossary, with a Collection of local Proverbs, and popular Superstitions, 8vo, 1788. 9. Rules for drawing Caricatures, 8vo. 1788. 10. Supplement to the Treatise on Ancient Armour and Weapons, 4to, 1789. 11. A Guide to Health, Beauty, Honour, and Riches; being a Collection of humorous Advertisements, pointing out the Means to obtain those Blessings; with a suitable introductory Preface, 8vo. 12. The Olio; being a Collection of Essays, in 8vo. 1793.

GROSS. *a.* (*gros*, French; *grosso*, Italian.) 1. Thick; bulky (*Baker.*) 2. Shameful; unseemly; enormous (*Hooker.*) 3. Intellectually coarse; palpable; impure; unrefined (*Smal.*) 4. Inelegant; disproportionate in bulk (*Thom.*) 5. Dense; not refined; not pure (*Bacon.*) 6. Stupid; dull (*Watts.*) 7. Coarse; rough; not delicate (*Wott.*). 8. Thick; fat; bulky (*Fell*).

GROSS. *s.* (from the adjective.) 1. The main body; the main force (*Addison.*) 2. The bulk; the whole not divided into its several parts (*Hook.*). 3. Not individual, but a body together (*Shak.*). 4. The chief part; the main mass (*Bacon.*) 5. The number of twelve dozen (*Locke*).

GROSS WEIGHT, the whole weight of merchandizes, with their dust and dross: as also the bag or chest wherein they are contained. An allowance is usually made out of the gross weight for tare and tret. See TARE.

GROSSA, an island of Dalmatia, in the Gulph of Venice, near the coast of the country of Zara. It is fifty miles in circumference, and belongs to the Venetians.

GRO'SSLY. *ad.* (from *gross.*) 1. Bulkily; in bulky parts; carefully. 2. Without subtilty; without art; without delicacy; coarsely; palpably (*Newton*).

GRO'SSNESS. *s.* (from *gross.*) 1. Coarseness; thickness; density (*Shakspeare*). 2. Inelegant fatness; unwieldy corpulence. 3. Want of refinement; want of delicacy (*Sh.*).

GROSSULARIA, the gooseberry. See RIBES.

GROT. *s.* (*grotte*, French; *grotta*, Italian.) A cave; a cavern for coolness and pleasure (*Prior*).

GROTE'SQUE. *a.* (*grotesque*, French.) Distorted of figure; unnatural (*Pope*).

GROTIUS (Hugo), or more properly HUGO DE GROOT, one of the greatest men in Europe of his time, was born at Delft, in 1583. He made so rapid a progress in his studies, that at the age of fifteen he had attained a great knowledge in philosophy, divinity, and civil law; and yet a greater proficiency in polite literature, as appeared by the commentary he had made at that age on Martianus Capella. In 1598, he accompanied the Dutch ambassador into France, and was honoured with several marks of esteem by Henry IV. He took his degree of doctor of laws in that kingdom; and at his return to his native country devoted himself to the bar, and pleaded before he was seventeen years of age. He was not twenty-four when he was appointed attorney-general. In 1613 he settled in Rotterdam, and was nominated syndic of that city; but did not accept of the office, till a promise was made him that he should not be removed from it. This prudent precaution he took from his foreseeing that the quarrels of the divines on the doctrine of grace, which had already given rise to many factions in the state, would occasion revolutions in the chief cities. The same year he was sent into England, on account of the divisions that reigned between the traders of the two nations, on the right of fishing in the northern seas; but he could obtain no satisfaction. He was afterwards sent to England, as it is thought, to persuade the king and the principal divines to favour the Arminians; and he had several conferences with king James on that subject. On his return to Holland, his attachment to Barnevelt involved him in great trouble; for he was seized, and sentenced to perpetual imsonment in 1619, and to forfeit all his goods and chattels. But after having been treated with great rigour for above a year and a half in his confinement, he was delivered by the advice and artifice of his wife, who having observed that his keepers had often fatigued themselves with searching and examining a great trunk-full of foul linen, which used to be washed at Gorkum, but now let it pass

without opening it, she advised him to bore holes in it to prevent his being stifled, and then to get into it. He complied with this advice, and was carried to a friend's house in Gorkum; where dressing himself like a mason, and taking a rule and trowel, he passed through the market-place, and stepping into a boat went to Valvet in Brabant. Here he made himself known to some Arminians, and hired a carriage to Antwerp. At first there was a design of prosecuting his wife, who staid in the prison; and some judges were of opinion that she ought to be kept there in her husband's stead: however, she was released by a plurality of voices, and universally applauded for her behaviour. He now retired into France, where he met with a gracious reception from that court, and Louis XIII. settled a pension upon him. Having resided there eleven years, he returned to Holland, on his receiving a very kind letter from Frederic Henry prince of Orange: but his enemies renewing their persecution, he went to Hamburgh; where, in 1634, queen Christina of Sweden made him her counsellor, and sent him ambassador into France. After having discharged the duties of this office above eleven years, he returned, in order to give an account to queen Christina of this embassy: when he took Holland in his way, and received many honours at Amsterdam. He was introduced to her Swedish majesty at Stockholm, and there begged that she would grant his dismission, in order that he might return to Holland. This he obtained with difficulty: and the queen gave him many marks of her esteem, though he had many enemies at this court. As he was returning, the ship in which he embarked was cast away on the coast of Pomerania: and being now sick, he continued his journey by land; but was forced to stop at Rostock, where he died, on the 28th of August, 1645. His body was carried to Delft, to be interred in the sepulchre of his ancestors. Notwithstanding the embassies in which he was employed, he composed a great number of excellent works; the principal of which are, 1. A treatise De jure belli et pacis, which is esteemed a master-piece. 2. A treatise on the Truth of the Christian Religion. 3. Commentaries on the Holy Scriptures. 4. The History and Annals of Holland. 5. A great number of Letters. All which are written in Latin: the piece on the Christian Religion has been translated into English, first by Dr. John Clarke, and afterwards by Dr. Spencer Madan, the present amiable and venerable bishop of Peterborough.

The most able and discriminating sketch of the intellectual powers of Grotius with which we are acquainted, is that given by sir James Macintosh, in the Introduction to his Course of Lectures delivered at Lincoln's Inn.

GROTSKAW, a town of Silesia, capital of a province of the same name. Lat. 50. 37 N. Lon. 17. 25. E.

GROTSKAW, a town of Servia. Lat. 45. 10 N. Lon. 21. 10 E.

GROTTO, or GROTTA, a large deep cavern or den in a mountain or rock. The word &c. is Italian, *grotta*, formed according to Menage, sec. from the Latin *crypta*. Du Cange observes that grotta was used in the same sense in the corrupt Latin. The ancient anchorites retired into dens and grottos, to apply themselves the more attentively to meditation. Okey-hole, Elden-hole, Peake's-hole, and Poole's are famous among the natural caverns or grottos of our country.

In grottos are frequently found crystals of the rock, stalactites, and other natural conglaciations, and those often of an amazing beauty.

GROTTO DEL CANI, a little cavern near Pozzuoli, four leagues from Naples, the steams whereof are of a mephitic or noxious quality; whence also it is called *bocca venenosa*, the poisonous mouth. There are other celebrated grottoes in Italy; as the grotto of Toligna, and the grotto del Serpi. There is likewise a very curious grotto in the isle of Antiparos. It appears to be about 80 yards high, and 100 broad; and the roof forms a pretty good arch, which entertains the eye with a vast variety of figures, of a white transparent crystalline substance, very naturally resembling vegetables, marble pillars, and a superb marble pyramid.

GROTTO. In picturesque gardening, a building in representation of a natural grotto. Its situation should be low, retired, and overarched, with dark shady trees, or superincumbent rock, with a rushy brook, bubbling within the reach of the ear. The architecture should be of the simplest and even rudest character consistent with classical taste; and it is generally and not inappositely lined with shell work, fossils and moss, united to the walls by a cement of rosin, bees-wax, and powdered freestone, or fine sand of a greyish hue.

GROVE. *s.* (from *grave.*) A walk covered by trees meeting above (*Glanville*).

GROVE. In gardening, a small wood growing wild, or purposely planted, intersected with paths and occasional seats.

Groves are not only a great ornament to gardens, but also the greatest relief against violent heats of the sun, affording shade in the hottest parts of the day. They are of two sorts, open and close. Open groves have large shady trees planted at such distances, that their branches approach just near enough to each other to prevent the rays of the sun from penetrating through them. Most of the groves that have been planted either in England or in the celebrated gardens of France are only a few regular lines of trees; many of which are avenues to the habitation, or lead to some building or other object: but these are by no means so grand as those that have been made in natural woods, where the trees have grown at irregular distances; where they have large spreading heads, and are left so far asunder as to permit the grass to grow under them: for nothing is more noble than fine spreading trees, with large stems, growing through grass, especially if the grass be well kept, and has a

good verdure; most of these planted groves moreover have gravel walks in straight lines between the trees, most formal and offensive, instead of graceful and elegant curves. In planting groves we should dispose the trees irregularly, which will give them a more magnificent and noble appearance, and also form a shade sooner than when they are planted in lines. When, in planting a garden, full grown trees are found upon the spot, they should, if possible, remain inviolate; for it will be better to put up with many inconveniencies than to destroy what will require an age to retrieve; so that nothing but offending the habitation, by being so near as to occasion great damps, should tempt us to cut them down. Close groves have frequently large trees standing in them; but the ground under these is filled with shrubs or underwood; so that their walks are private, and screened from winds: by which means they are rendered agreeable for exercise when the air is either too hot or too cold for walking in the more exposed parts of the garden. These are often contrived so as to bound the open groves, and frequently to hide the walls or other inclosures of the garden; and when properly laid out, with dry walks winding through them, with sweet smelling shrubs and flowers irregularly planted on their sides, they have a charming effect, and are of real utility.

To GRO'VEL. *v. n.* (*grufde*, Islandick, flat on the face.) 1. To lie prone; to creep low on the ground. To be mean; to be without dignity (*Addison*).

GROUND. *s.* (ᵹꝛunꝺ, Saxon.) 1. The earth, considered as superficially extended (*Milton*). 2. The earth as distinguished from air or water. 3. Land; country (*Hudibras*). 4. Region; territory (*Milton*). 5. Estate; possession (*Dryden*). 6. The floor or level of the place (*Matthew*). 7. Dregs; lees; feces (*Sharp*). 8. The first stratum of paint upon which the figures are afterwards painted (*Hakewill*). 9. The fundamental substance; that by which the additional or accidental parts are supported. 10. The plain song; the tune on which descants are raised (*Shaks*). 11. First hint; first traces of an invention. 12. The first principles of knowledge (*Milton*). 13. The fundamental cause (*Sidney*). 14. The field or place of action (*Daniel*). 15. The space occupied by an army as they fight, advance, or retire (*Dryden*). 16. The intervening space between the flyer and pursuer (*Addison*). 17. The state in which one is with respect to opponents or competitors (*Atterbury*). 18. State of progress or recession (*Dryden*). 19. The foil to set a thing off (*Shakspeare*).

GROUND, in music, a composition in which the bass consisting of a few bars of independent notes, is perpetually repeated to a continually varying melody. Of this kind of composition, Purcell and Pepusch have published celebrated pieces.

To GROUND. *v. a.* (from the noun.) 1. To fix on the ground. 2. To found, as upon cause or principle *Dryden*). 3. To settle in first principles or rudiments of knowledge (*Ephesians*).

GROUND. The pret. and part. pass. of *grind*.

GROUND-ASH. *s.* A saplin of ash taken from the ground (*Mortimer*).

GROUND-BAIT. *s.* A bait made of barley or malt boiled, thrown where you angle (*Walton*).

GROUND-FLOOR. *s.* The lower part of a house.

GROUND-IVY, in botany. See GLECHOMA.

GROUND-OAK, a sapling oak.

GROUND-PINE, in botany. See TEUCRIUM.

GROUND-PLATE. *s.* (In architecture.) The outermost pieces of timber lying on or near the ground, and framed into one another with mortises and tenons (*Mortimer*).

GROUND-PLOT. *s.* 1. The ground on which any building is placed (*Sidney*). 2. The ichnography of a building.

GROUND-RENT. *s.* Rent paid for the privilege of building on another man's ground.

GROUND-ROOM. *s.* A room on the level with the ground (*Tatler*).

GRO'UNDEDLY. *ad.* (from *grounded*.) Upon firm principles (*Glanville*).

GRO'UNDLESS. *a.* (from *ground*.) Void of reason; wanting ground (*Freeholder*).

GRO'UNDLESSLY. *ad.* Without reason; without cause (*Boyle*).

GRO'UNDLESSNESS. *s.* (from *groundless*.) Want of just reason (*Tillotson*).

GRO'UNDLING. *s.* (from *ground*.) A fish which keeps at the bottom of the water: hence one of the low vulgar (*Shakspeare*).

GROUNDLING, in ichthyology. See COBITIS.

GRO'UNDLY. *ad.* (from *ground*.) Upon principles; solidly: not in use (*Ascham*).

GRO'UNDSEL. *s.* (ᵹꝛunꝺ, and ꞅyle, the basis, Saxon.) The timber or raised pavement next the ground (*Moxon*).

GROUNDSEL, in botany. See SENECIO.

GROUNDSEL TREE. See BACCHARIS.

GRO'UNDWORK. *s.* (*ground* and *work*.) 1. The ground; the first stratum (*Dryden*). 2. The first part of an undertaking; the fundamentals (*Milton*.) 3. First principle; original reason (*Spenser*).

GROUP. *s.* (*grouppe*, French.) A crowd; a cluster; a huddle (*Swift*).

To GROUP. *v. a.* (*groupper*, French.) To put into a crowd; to huddle together (*Prior*).

GROUP, in music, a kind of diminution or breaking of long notes, whereby they are reduced to a cluster of shorter ones.

In architecture we sometimes say, a group of columns; speaking of three or four columns joined together on the same pedestal. When there are but two together, we say, a couple, not a group, of columns.

GROUPE'S ISLANDS, two groups, or clusters, of islands in the South Pacific Ocean, extending for the space of nine leagues. The

two largest are separated by a strait, about 400 fathoms wide, and each surrounded by a number of small ones, as it were chained together by rocks under water, and placed in all sorts of directions; they are all covered with cocoa-trees. The inhabitants are well proportioned, almost naked, and painted brown, with black hair, tied in a kind of net-work. These islands were probably discovered by Roggewin. Lon. 142. 45. to 142. 54. W. Greenwich. Lat. 17. 58. to 18. 6. S.

GROUSE, or RED GAME: a species of the genus TETRAO (which see,) forming a frequent object of the sportsman's attention, and peculiarly protected by the laws of this country.

It is enacted by the 13th George III. c. lv. s. 2, That no person shall kill, destroy, carry, sell, buy, or have in his possession any grouse, commonly called red game, between the tenth day of December and the twelfth day of August in any year, upon pain of forfeiting, for the first offence, a sum not exceeding 20l. nor less than 10l. and for the second, and every subsequent offence, a sum not exceeding 30l. nor less than 20l. one moiety thereof to go to the informer, and the other moiety to the poor of the parish: and in case the penalty be not paid, and there be no distress to be had, the offender be committed to prison, to be kept to hard labour for any time not exceeding six, nor less than three months.

And for the further preservation of both black game and grouse, or red game, it is enacted, That any person who shall, between the second day of February and the twenty-fourth day of June, in any year, burn any grig, ling, heath, furze, goss, or fern, on any mountains, hills, heaths, moors, forests, chases, or other wastes, shall be committed to the house of correction for any time not exceeding one month, nor less than ten days; there to be whipped, and kept to hard labour.

The black grous are fond of woody and mountainous situations, and perch like the pheasant. Their food is various; the bilberry, and in winter the tops of heath, and in summer they sometimes feed on corn. The length of the male is from one foot ten inches to two feet nine. It weighs nearly four pounds; the bill is dusky black, the eyes dark-blue: below each eye is a spot of a dirty white, and above, a larger one, of a bright scarlet. The plumage of the body black, glossed over the neck and rump, with a shining blue: the covers of the wings are of a dusky brown; the tail consists of sixteen black feathers, and is much forked; the feathers under the tail, and inner covers of the wings, are of a pure white. The female is only one foot six inches long, breadth two feet six; the eye has the dusky white spot under it like the male, the head and neck are marked, alternately, with bars of dull red and black; the breast with dusky black and white; the back covers of the wings and tail are similar in colour to the neck, except the red being deeper; the tail is slightly forked, and consists of eighteen feathers, variegated with red and black; under the tail the feathers are white, marked with a few spots of black and orange. These birds never pair; but in spring the males assemble at their accustomed resorts, when they crow and clap their wings; the females, at this signal, resort to them. They will fight like game-cocks; and at that time are so careless of their safety, that two or three have been killed at a shot; and have sometimes even been knocked down with a stick. The food of the red grous is nearly similiar to that of the black. The male weighs nineteen ounces, and is in length fifteen inches; the bill is black; nostrils covered with small red and black feathers: the throat is red; each eye is arched with a spot of a bright scarlet; the plumage on the head and neck is of a light tawny red; each feather is marked with transverse bars of black; the back and scapula feathers are of a deeper red, and on the middle of each feather is a large black speck; breast and belly dull purplish brown, crossed with numerous raven dusky lines; tail even, consisting of sixteen feathers; the four middle ones barred, all the others black; the thighs are of a pale red, barred obscurely with black; the legs and feet clotted to the very claws, with thick, soft, white feathers. The female only weighs fifteen ounces; the colours are less bright, and the naked red part over the eye is less conspicuous, and the edges of it not so deeply fringed as that of the male.

The flesh of both species soon taints, and they should be drawn as soon as killed; but that of the black grous is most liable to corrupt. Though the red game is not found in any part of England, south of the river Trent, the mail coaches will convey it, in good preservation, to London, if put up carefully; but it was with great difficulty the late earl Delawar could send the black game in a state fit to be eaten, by a special messenger, from the New Forest to their majesties, at Windsor. The flesh of it, even if dressed as soon as killed, is hardly of a firmer texture than potted meat.

GROUT. *s.* (ᵹnut, Saxon.) 1. Coarse meal; pollard (*King*). 2. That which purges off (*Dryden*). 3. A kind of wild apple. 4. A thin coarse mortar used in building.

To GROW. *v. n.* pret. *grew*; part. pass. *grown* (ᵹnopan, Saxon.) 1. To vegetate; to have vegetable motion; to increase by vegetation (*Wisdom*). 2. To be produced by vegetation (*Abbot*). 3. To shoot in any particular form (*Dryden*). 4. To increase in stature (*Samuel*). 5. To come to manhood from infancy (*Wake*.). 6. To issue, as plants from a soil (*Dryden*). 7. To increase in bulk; to become greater. 8. To improve; to make progress (*Pope*). 9. To advance to any state (*Shakspeare*). 10. To come by degrees (*Rog*.). 11. To come forward; to gather ground (*Spenser*). 12. To be changed from one step to another; to become either better or worse (*Dryden*). 13. To proceed as from a cause (*Hooker*). 14. To accrue; to be forthcoming (*Shakspeare*). 15. To adhere; to stick to-

gether (*Walton*). 16. To swell: a sea term (*Raleigh*).

GRO'WER. *s.* (from *grow.*) An increaser.

To GROWL. *v. n.* (*grollen*, Flemish.) 1. To snarl like an angry cur (*Ellis*). 2. To murmur; to grumble (*Gay*).

GROWN. The participle passive of *grow.* 1. Advanced in growth. 2. Covered or filled by the growth of any thing (*Proverbs*). 3. Arrived at full growth or stature (*Locke*).

GROWTH. *s.* (from *grow.*) 1. Vegetation; vegetable life (*Atterbury*). 2. Product; thing produced (*Milton*). 3. Increased number, bulk, or frequency. 4. Increase of stature; advance to maturity. 5. Improvement; advancement (*Hooker*).

GRO'WTHEAD. GRO'WTNOL. *s.* (from *gross* or *great head.*) 1. A kind of fish (*Ains.*). 2. An idle lazy fellow: obsolete (*Tusser*).

GROYNE, a river of Spain, in Galicia, which enters the Bay of Biscay, at Corunna. Hence our sailors frequently call the town by the name of the river—the Groyne.

GRUAJIRES, a town of Swisserland, in the canton of Friburg, with a castle where the bailiff resides. Lat. 46. 35 N. Lon. 6. 43 E.

GRUARII, in our old writers, the principal officers of the forest in general.

GRUB, the name of worms produced from the eggs of beetles, which are at length transformed into winged insects of the same species with their parents. See LARNA.

To GRUB. *v. a.* (*grabun*, preterit *grob*, to dig, Gothic.) To dig up; to destroy by digging; to root out of the ground (*Dryden*).

GRUB. *s.* A short thick man; a dwarf (*Carew*).

GRUBBIA, in botany, a genus of the class octandria, order monogynia. Involucre two-valved, three-flowered; corol four-petalled, superior; berry one-celled; stigma notched. One species: an African shrub, with opposite ovate-linear leaves, and lateral flowers.

To GRUBBLE. *v. n.* (*grubelen*, German.) To feel in the dark (*Dryden*).

GRUBENHAGEN, a town and castle of Lower Saxony, and the chief place of a principality of the same name, belonging to the house of Hanover. Lat. 51. 31 N. Lon. 10. 3 E.

To GRUDGE. *v. a.* (*grwgnach*, Welsh.) 1. To envy; to see any advantage of another with discontent (*Sidney*). 2. To give or take unwillingly (*Addison*).

To GRUDGE. *v. n.* 1. To murmur; to repine (*Hooker*). 2. To be unwilling; to be reluctant (*Raleigh*). 3. To be envious (*James*). 4. To wish in secret (*Dryden*). 5. To give or have any uneasy remains (*Dryden*).

GRUDGE. *s.* (from the verb.) 1. Old quarrel; inveterate malevolence (*Shaks.*). 2. Anger; ill will (*Swift*). 3. Unwillingness to benefit (*Ben Johnson*). 4. Envy; odium; invidious censure. 5. Remorse of conscience (*Ainsworth*). 6. Some little commotion, or forerunner of a disease (*Ainsworth*).

GRU'DGINGLY. *ad.* (from *grudge.*) Unwillingly; malignantly; reluctantly (*Dryden*).

GRU'EL. *s.* (*gruelle*, French.) Food made by boiling oatmeal in water (*Arbuthnot*).

GRUFF. *a.* (*groff*, Dutch.) Sour of aspect; harsh of manners (*Addison*).

GRU'FFLY. *ad.* Harshly; ruggedly (*Dr.*).

GRU'FFNESS. *s.* (from *gruff.*) Ruggedness of mien; harshness of look or voice.

GRUINALES, in botany, the name of the fourteenth order of Linéus's Fragments. This order furnishes both herbaceous and woody plants. The roots are sometimes fibrous, and sometimes tuberous. In some species of the oxalis, wood-sorrel, they are jointed; the stems are cylindric, and the young branches in some nearly square; the buds are of a conic form, covered with scales; the leaves in some genera are simple, in others compound; the flowers are hermaphrodite; the calyx consists either of five distinct leaves, or of one leaf divided almost to the bottom into five parts; it generally accompanies the seed-bud to its maturity: the petals are five, spreading, and are frequently funnel-shaped; there are generally ten stamens, the anthers oblong, and frequently attached to the filaments by the middle; the seed-vessel is commonly a five-cornered capsule, with one, three, five, or ten cells, with one seed in each cell. In this order are the geranium, crane's-bill; linum, flax; oxalis, wood-sorrel; guiacum, lignum-vitæ.

GRUM. *a.* (contracted from *grumble.*) Sour; surly; severe (*Arbuthnot*).

To GRU'MBLE. *v. n.* (*grummelen*, Dutch.) 1. To murmur with discontent (*Prior*). 2. To growl; to gnarl (*Dryden*). 3. To make a hoarse rattle (*Rowe*).

GRU'MBLER. *s.* (from *grumble.*) One that grumbles; a murmurer (*Swift*).

GRU'MBLING. *s.* (from *grumble.*) A murmuring through discontent (*Shakspeare*).

GRUME. *s.* (*grumeau*, Fr. *grumus*, Latin.) A thick viscid consistence of a fluid (*Quincy*).

GRU'MLY. *ad.* (from *grum.*) Sullenly; morosely.

GRU'MOUS. *a.* (from *grume.*) Thick; clotted (*Arbuthnot*).

GRU'MOUSNESS. *s.* (from *grumous.*) Thickness of a coagulated liquor (*Wiseman*).

GRUNERDE, in mineralogy. See GREEN EARTH.

GRUNINGEN, a town of Lower Saxony, in the principality of Halberstadt. Lat. 52. 4 N. Lon. 11. 41 E.

GRUNINGEN, a town of Swisserland, in the canton of Zuric, capital of a bailiwic of the same name. Lat. 47. 14 N. Lon. 8. 43 E.

GRUNSEL, in architecture. See GROUNDSEL.

GRUNSTEIN, in mineralogy, a particular kind of trap, coloured green or greenish, in consequence of its containing olivin. See BASALTES TRAPEZUM.

To GRUNT. *To* GRU'NTLE. *v. n.* (*grunio*, Latin.) To murmur like a hog (*Gay*).

GRUNT. *s.* (from the verb.) The noise of a hog (*Dryden*).

GRU'NTER. *s.* (from *grunt.*) 1. He that grunts. 2. A kind of fish.

GRU'NTLING. *s.* (from *grunt.*) A young hog.

GRUPPO, in music, a shake: it consists in the alternate reiteration of two notes in juxta-position to each other, with a close on the note immediately beneath the lower, or above the upper of them.

GRUS, in ornithology. See ARDEA.

GRUS, in astronomy, the Crane, a new southern constellation not visible in our latitude. It consists of 14 stars of the first six magnitudes, viz. 0. 2. 1. 2. 9. 0. The Arabians give the name of Grus to the constellation which we call Ophiuchus.

GRUS, in antiquity, a dance performed yearly by the young Athenians around the temple of Apollo, on the day of the Delia.

To GRUTCH. *v. n.* (corrupted from *grudge*). To envy; to repine: not used (*Ben Jonson*).

GRUTCH. *s.* (from the verb.) Malice; ill-will (*Hudibras*).

GRUTERUS (Janus), an illustrious philologist, was born in 1560 at Antwerp. His father, who was a burgomaster of Antwerp, took refuge in England on account of his religion, he being a protestant, when Gruterus was but an infant. He received his education under the eye of his mother, who was a very accomplished woman; after which he was sent first to Cambridge, and then to Leyden, where he took the degree of doctor in civil law. He was professor of history in the university of Wirtemberg, and afterwards filled the professor's chair at Heidelberg. He published various useful works; the most important of which is his collection of Inscriptions. He died in 1627.

GRUTUM. (*grutum, i.* n.). Milium. A hard white tubercle of the skin, resembling in size and appearance a millet-seed.

GRY, a measure of length, being 1000th part of a foot.

Hence, any very little thing, or one of small value, is often called a gry.

GRYLLUS. Locust. Cricket. Grasshopper. In zoology, a genus of the class insecta, order hemiptera. Head inflated, armed with jaws; feelers filiform; antennas setaceous, or filiform; wings four, deflected, convolute; the lower ones plaited; hindless; formed for leaping; claws double on all the feet. This is an extensive genus, consisting of not less than two hundred and one species which contain sections of Fabricius.

A. Antennas ensiform; head conic, longer than the thorax; denominated *truxalis*.

B. Thorax carinate: antennas filiform, shorter than the thorax; feelers equal: denominated *acrydium*.

C. Antennas setaceous; feelers unequal; thorax rounded; tail with two bristles: denominated *acheta*.

D. Antennas setaceous; feelers unequal; male with an ovellate spot at the base of each wing-case; tail of the female armed with a sword-like projection: denominated *locusta*.

E. Antennas filiform; tentacles simple; tail simple; throat with a horn-like protuberance. The *gryllus* of Fabricius.

The insects of this family feed on plants and herbs; except those of the section *truxalis*, which prey on other insects. The larves and pupes resemble the perfect insects, reside chiefly under ground, and are six-footed, voracious and active: they were the only animals of this class of which Moses permitted the Israelites to eat; and are at present used as an article of food by the natives of Africa and India.

We shall instance a few of the chief species.

1. G. grylotalpa. Mole-cricket. Wings terminating in slender tails longer than the abdomen; fore-feet palmate. Body dark chesnut-brown, hairy; wing-cases shorter than the body, veined; antennas shorter than the body. Inhabits gardens and cultivated places of Europe and America, where it burrows below the surface of the earth, and is very destructive, eating and consuming the roots of trees.

2. G. domesticus. House-cricket. Wings tailed, longer than the wing-cases: body glaucous. An inhabitant of almost every house, about ovens and kitchen-chimneys; wanders about during the whole night, maintaining a continual chirping, especially before rain: is said to forsake houses infected with the cockroach, and is destroyed by pills of arsenic, and the fresh root of the daucus mixt with flour, or the root of the nymphæa boiled in milk.

3. G. campestris. Field cricket. Wings shorter than the wing-cases; body blackish; style linear. Inhabits Europe: chirps from the beginning of May till the equinox, and is said, when domesticated, to drive out the house-cricket.

4. G. verrucivorus. Wings green, spotted with brown; antennas as long as the body. Inhabits England, and most parts of Europe; and is collected by the common people of Sweden for the purpose of destroying warts on the hands, which it is said to perform by biting off the excrescence, and discharging on the wound a corrosive liquor.

5. G. viridissimus. Head, thorax, and wing-cases green, immaculate: antennas very long; legs yellowish; a lancet or swordlike process straight and serrate terminal to the body.

This sword-like process is larger and more powerful in the female than in the male. With this she excavates a number of holes in the dried branch of a tree; into each of these holes eight or ten of her eggs are dropped; there they are surrounded with the kind of food which is most suitable for them in their larve state. The disposition of the eggs is in rows, and placed in the middle of the trees; the soft substance of which is the first food of the insect after it leaves the ovum. The insect that proceeds from each of these eggs, after it has grown for some time, and before reaching a size incompatible with escaping by

the narrow mouth of the hole, takes a final departure from the place of its birth.

The larves having thus left their egg state, and acquired the use of their limbs, the two anterior of which are formed for digging the ground, soon apply them to that purpose, and excavate for themselves a subterraneous retreat among the roots of plants, which they gnaw, and support themselves upon the juices that thence exude. In this state they remain till they are ready to undergo another transformation, which introduces them into the open air in the form of winged insects.

6. G. migratorius. Travelling locust. Thorax subcarinate, of a single segment; mandibles blue: bodies brownish, varied with darker spots; legs blue; hind-thighs and shanks yellowish. Inhabits Tartary, and migrates in incredible swarms into various parts of Europe. The mischief these voracious creatures do, when they appear in vast legions, far exceeds the calamities occasioned by any other tribes of animals. By suddenly destroying all vegetation they change the most fertile provinces into barren deserts, leaving behind them desolation and famine, and diseases of various kinds. They have occasionally appeared in small flights in England, but have perished by the cold in a short time. This is probably the species which is related to have constituted one of the plagues of Egypt, Numbers chap. x.

When the locusts take the field, they have, as it is said, a leader at their head, whose flight they observe, and pay a strict attention to all his motions. They appear at a distance as a black cloud, which, as it approaches, gathers upon the horizon, and almost hides the light of day. It often happens that the husbandman sees this imminent calamity pass away without doing him any mischief, and the whole swarm press forward, to settle upon the labours of some less fortunate cultivator: but wretched is the district upon which they alight. They ravage the meadow and the pasture ground, strip the trees of their leaves, and the gardens of every vegetable. It is said that their mere bite also, even when they do not devour a plant, so contaminates it, that it is sure to wither away; which adds largely to the devastation which would otherwise be produced by them.

Yet when dead they prove still more noxious, by infecting the air with a most intolerable stench. Orosius tells us that in the year of the world 3800, an incredible number of these insects infested Africa; which after having eaten up every thing that was green, flew off and were drowned in the Red Sea, where they caused a more pestilential effluvium than would have proceeded from the putrescent bodies of many thousands of mankind.

The eastern borders of the Russian empire are subjected sometimes to the awful visitations of this insect. That which happened in 1690, which extended from Russia over a great part of Poland and Lithuania, was singularly destructive. In some places the locusts were seen lying dead, heaped upon each other four feet deep; in others they covered the surface like a black cloth; the trees were seen bending beneath their weight, and the damage which the inhabitants sustained was beyond computation.

In Barbary their numbers are also formidable, and their visits more frequent: during the year 1724, a traveller from Britain, remarkable for the accuracy of his observations (Dr. Shaw), witnessed the havoc they committed in that ill-fated country. Towards the end of March they began to appear with a southerly wind: through the succeeding months, their numbers continued to increase so prodigiously, that during the heat of the day they rose in swarms so large as to darken the sun. In the middle of May they began to retire, for the purpose of depositing their eggs in the drier plains of the interior country.

About the middle of summer the young, already ripe for devastation, made another incursion, in several bodies of a vast extent; although then in the form of worms they crawled forward, climbed the trees, walls and houses, devouring every plant in their way: it was in vain that the inhabitants dug trenches through their fields and filled them with water, in vain they collected large rows of heath, stubble, and other combustible matter to set them on fire on the approach of the locusts. The trenches were soon filled, and the fires extinguished by the immense swarms that succeeded each other.

The locusts which are thus active in their larva state, remain only about a month in that form; after having completed their growth, they cast that skin which gives them their vermicular shape; and, in order to prepare themselves for this transformation, they attach their hind legs to some twig, where, after some laborious efforts, and several undulating motions, they at last burst the skin; at first, the head only appears, but soon after the rest of the body is disengaged, the whole operation occupying only seven or eight minutes. After casting their covering they remain for a little in a languishing state, till the air hardens their wings, and the heat of the sun again invigorates them, when they resume their former voracious habits, with an increase both of strength and agility.

In some parts of the world the inhabitants convert what so generally is considered as a plague to an advantage, by making the locusts an article of diet. It is for this purpose, that in many parts of the east they are caught in small nets, which are constructed for entangling them. When a sufficient quantity is thus procured, they are roasted over the fire in an earthen pan till the wings and legs drop off: when thus prepared they are reckoned tolerable food, and are said to taste like crayfish. See Nat. Hist. Pl. CXXI.

GRYNÆUS (Simon), son to a peasant of Suabia, born in 1493, was Greek professor at Heidelberg in 1523. He took a tour into England, and received great civility from the lord chancellor Sir Thomas More, to whom

Erasmus had recommended him. He was a learned and laborious man, and did great service to the commonwealth of letters. He was the first who published the Almagest of Ptolemy in Greek. He also published a Greek Euclid, and Plato's works, with some commentaries of Proclus.

GRYPHOSIS. (*gryphosis*, γρυφωσις; from γρυπσω, to incurvate.) A disease of the nails, which turn inwards, and irritate the soft parts below.

GUADAGNOLO (Philip), a learned orientalist of Italy, was born about 1596, at Magliano; and died at Rome in 1656. He translated the Bible into Arabic, for the eastern churches; and addressed Christina, queen of Sweden, in an oration in the same language. He wrote an excellent grammar of the Arabic in Latin; and compiled an Arabic dictionary, the manuscript of which is preserved in the convent of San Lorenzo, in Lusina.

GUADALAJARA, or GUADALAXARA, a town of New Castile, in Spain, 30 miles N.E. of Madrid. Lat. 40. 36 N. Lon. 2. 47 W.

GUADALAJARA, the capital of a province of the same name, in North America. It is the see of a bishop. Lat. 20. 50 N. Lon. 104. 49 W.

GUADALOUPE, a town of Estremadura, in Spain. Lat. 39. 12 N. Lon. 5. 3 E.

GUADALOUPE, one of the Leeward Islands in the W. Indies, lying between Antigua and Dominica. It is divided into two parts by a narrow strait, called the Salt River. At this place the land on each side is not above four miles broad, and by this strait the sea on the N.W. communicates with that on the S.E. The N.W. part is 60 miles in length, and 24 in breadth. The S.E. part, in extent, is much the same. The French began to settle this island in 1632. It was taken by the English in 1759, but restored in 1763. It is said to be the best of all the Caribbee Islands, the soil being exceedingly good, and well watered near the sea, by rivulets which fall from the mountains. On this island is a volcano called the Mountain of Sulphur.

GUADALQUIVER, one of the most famous rivers of Spain, which rises in Andalusia, and falls into the gulf of Cadiz.

GUADIANA, a river of Spain, which rises in New Castile, separates Algarve from Andalusia, and falls into the bay of Cadiz, between Castro Marino and Agramonte.

GUADIX, a town of Spain, in the kingdom of Granada, with a bishop's see. Lat. 37. 4 N. Lon. 2. 47 W.

GUAIACUM. (*guaiacum*, from the Spanish *guayacan*, which is formed from the Indian *hoaxacan*.) In botany, a genus of the class decandria, order monogynia. Calyx five-cleft, unequal; petals five, inserted into the calyx; capsule angular, three or five-celled. Three species, as follow:

1. G. dubium. One pair of leaflets, oblong-lanceolate, obtuse. A native of Tongatabu.

2. G. sanctum. Leaflets many pairs, acute. A native of the West Indies.

3. G. officinale. Lignum vitæ. Leaflets two or three pairs, obtuse. A native of the West Indies. The wood, gum, bark, fruit, and even the flowers, have been found to possess medicinal qualities. The wood is brought principally from Jamaica, in large pieces of four or five hundred weight each, and from its hardness and beauty is used for various articles of turnery ware. It scarcely discovers any smell, unless heated, or while rasping, in which circumstance it yields a light aromatic one: chewed, it impresses a slight acrimony, biting the palate and fauces. The gum, or rather resin, is obtained by wounding the bark in different parts of the body of the tree, or by what has been called jagging. It exudes copiously from the wounds, though gradually; and when a quantity is found accumulated upon the several wounded trees, hardened by exposure to the sun, it is gathered and packed up in small kegs for exportation: it is of a friable texture, of a deep greenish colour, and sometimes of a reddish hue; it has a pungent acrid taste, but little or no smell, unless heated. The bark contains less resinous matter than the wood, and is consequently a less powerful medicine, though in a recent state it is strongly cathartic. The flowers or blossoms are laxative, and in Jamaica are commonly given to children in the form of syrup. It is only the wood and resin of guaiacum which are now in general medicinal use in Europe; and as the efficacy of the former is supposed to be derived merely from the quantity of resinous matter which it contains, they may be considered indiscriminately as the same medicine. Guaiacum was first introduced into the materia medica soon after the discovery of America; and previous to the use of mercury in the lues venerea, it was the principal remedy employed in the cure of that disease; its great success brought it into such repute, that it is said to have been sold for seven gold crowns a pound: yet notwithstanding this, its failure was such that it soon became quite superseded by mercury; and though it be still occasionally employed in siphilis, yet it is rather with a view to correct other diseases in the habit, than for its effects as an antivenereal. It is now more generally employed for its virtues in curing gouty and rheumatic pains, and some cutaneous diseases.

In the Philosophical Transactions for 1806, we have a very complete analysis of this substance: by distillation 100 parts yielded

Acidulous water - -	5.5
Thick brown oil - -	24.5
Thin empyreumatic oil -	29.0
Charcoal - -	30.5
Gases consisting of carbonic acid and carbureted hydrogen -	10.5
	100.0

Hence it is inferred that guaiacum agrees in many respects with the resins, but it differs

from them, 1. in the quantity of charcoal it leaves when distilled in close vessels; 2. in the action that nitric acid has upon it; and, 3. in the changes of colour that it undergoes when its solutions are treated with nitric and oxymuriated acids. Its properties may be thus enumerated: it is a solid substance resembling a resin; its colour varies, but is generally greenish; it is readily dissolved in alcohol; alkaline solutions dissolve it with ease: most of the acids act upon it with considerable energy; if digested in water, a portion is dissolved, the water acquiring a greenish-brown colour: the liquid being evaporated, leaves a brown substance which possesses the properties of an extract, being soluble in hot water and alcohol, but scarcely at all in sulphuric ether, and forming precipitates with the muriates of alumina, tin, and silver.

GUALDO, a town of Italy, in Ancona, eight miles N.W. of Nocera. Lat. 43. 6 N. Lon. 12. 43 E.

GUALEOR, GUALIOR, or GOWALIER, a large town of Hindustan in Asia, and capital of a province of the same name, with an ancient and celebrated fortress of great strength. It is situated in the very heart of Hindustan Proper, being about 80 miles to the south of Agra, the ancient capital of the empire, and 130 from the nearest part of the Ganges. From Calcutta it is, by the nearest route, upwards of 800 miles, and 910 by the ordinary one; and about 280 from the British frontiers. Its latitude is 26. 14, and longitude 78. 26 from Greenwich.

GUALTHE'RIA. In botany, a genus of the class decandria, order monogynia. Calyx double; the outer two-leaved, inner five-cleft; corol ovate; nectary ten erect points; capsule five-celled, covered by the inner berried calyx. Two species: natives of Canada and New Zealand.

GUAM, the principal of the Ladrone Islands, in the South Sea. Lat. 13. 5 N. Lon. 145. 15 E.

GUANA, in amphibiology. See LACERTA.

GUANAHARIA, or ST. SALVADORE, now called CAT ISLAND, one of the Bahama Islands, in America. It was discovered by Christopher Columbus on the day that the ship's crew designed to have murdered him, in 1492. Lat. 24. 25 N. Lon. 75. 5 W.

GUANO, a substance found on many of the small islands in the South Sea, which are the resort of numerous flocks of birds, particularly of the ardea and phœnicopterus genus. It is dug from beds fifty or sixty feet thick, and used as a valuable manure in Peru, chiefly for Indian corn. It is of a dirty yellow colour, nearly insipid to the taste, but has a powerful smell, partaking of castor and valerian. According to the analysis of Fourcroy and Vauquelin, about one-fourth of it is uric acid, partly saturated with ammonia and lime. It contains likewise oxalic acid, partly saturated with ammonia and potash; phosphoric acid combined with the same bases and with lime; small quantities of sulphate and muriate of potash and ammonia; a small portion of fat matter; and sand, partly quartzose, partly ferruginous. (*Brit. Ency.*).

GUANUGO, the capital of a district of the same name in S. America. Lat. 9. 55 S. Lon. 74. 55 W.

GUANZAVELCA, a town of Peru, in S. America. Its neighbourhood abounds in mines of quicksilver. Lat. 12. 36 S. Lon. 79. 39 W.

GUARANTEE, or WARRANTEE, in law, a term relative to warrant or warranter, properly signifying him whom the warranter undertakes to indemnify or secure from damage. Guarantee, however, is more frequently used for a warranter, or a person who undertakes and obliges himself to see a second person perform what he has stipulated to the third. See WARRANTRY.

To GUA'RANTY. *v. a.* (*guarantir*, Fr.) To undertake to secure the performance of any articles.

To GUARD. *v. a.* (*garder*, French; from our word *ward.*) 1. To watch by way of defence and security. 2. To protect; to defend (*Waller*). 3. To preserve by caution (*Addison*). 4. To provide against objections (*Br.*). 5. To adorn with lists, laces, or ornamental borders: obsolete (*Shakspeare*).

To GUARD. *v. n.* To be in a state of caution or defence (*Collier*).

GUARD. *s.* (*garde*, Fr. *ward*, Teut.) 1. A man, or body of men whose business is to watch by way of defence (*Milton*). 2. A state of caution, or vigilance (*Smalridge*). 3. Limitation; anticipation of objection (*Atter.*). 4. An ornamental hem, lace, or border. 5. Part of the hilt of a sword.

GUARD, in the military art, is a duty performed by a body of men, to secure an army or place from being surprised by an enemy. In garrison the guards are relieved every day: hence it comes that every soldier mounts guard once every three or four days in time of peace, and much oftener in time of war. See HONOURS.

GUARD (Advanced), called also VAN GUARD, is a party of either horse or foot that marches before a more considerable body, to give notice of any approaching danger. These guards are either made stronger or weaker, according to situation, the danger to be apprehended from the enemy, or the nature of the country.

GUARD (Artillery), is a detachment from the army to secure the artillery when in the field. Their *corps de garde* is in the front of the artillery park, and their sentries dispersed round the same. This is generally a forty-eight-hours guard; and upon a march, this guard marches in the front and rear of the artillery, and must be sure to leave nothing behind: if a gun or waggon breaks down, the officer that commands the guard is to leave a sufficient number of men to assist the gunners in getting it up again. *Artillery Quarter-Guard*, is frequently a non-commissioned

officer's guard from the royal regiment of artillery, whose *corps de garde* is always in the front of their incampment. *Artillery Rear Guard*, consists of a corporal and six men, posted in the rear of the park.

GUARD (Grand), three or four squadrons of horse, commanded by a field officer, posted at about a mile or a mile and a half from the camp, on the right and left wings, towards the enemy, for the better security of the camp.

GUARD (Forage), a detachment sent out to secure the foragers, and who are posted at all places, where either the enemy's party may come to disturb the foragers, or where they may be spread too near the enemy, so as to be in danger of being taken. This guard consists both of horse and foot, and must remain on their posts till the foragers are all come off the ground.

GUARD (Main), is that from which all other guards are detached.

GUARD (Picquet), a good number of horse and foot, always in readiness in case of an alarm: the horses are generally saddled all the time, and the riders booted. The foot draw up at the head of the battalions frequently at the beating of the tat-too; but afterwards return to their tents, where they hold themselves in readiness to march upon any sudden alarm. This guard is to make resistance in case of an attack, until the army can get ready.

GUARD (Baggage), is usually an officer's guard, who has the care of the baggage on a march.

GUARD (Quarter), is a small guard commanded by a subaltern officer, posted in the front of each battalion, at 222 feet before the front of the regiment.

GUARD (Rear), that part of the army which brings up the rear on a march, generally composed of all the old grand guards of the camp. The rear-guard of a party is frequently eight or ten horse, about 500 paces behind the party.

GUARD (Yeomen of the), first raised by Henry VII. in the year 1485. They are a kind of pompous foot-guards to the king's person, and are generally called by a nickname the Beef Eaters. They were anciently 250 men of the first rank under gentry, and of larger stature than ordinary, each being required to be six feet high. At present there are but 100 in constant duty, and 70 more not on duty; and when any one of the 100 dies, his place is supplied out of the 70. They go dressed after the manner of king Henry VIII's time. Their first commander or captain was the earl of Oxford, and their pay is 2s. 6d. per day.

GUARD, in fencing, implies a posture proper to defend the body from the sword of an antagonist.

GUARDS, also imply the troops kept to guard the king's person, and consist both of horse and foot.

GUARDS, in astronomy, a name sometimes applied to the two stars in Ursa Minor, nearest the north pole, one of which is called the pole-star.

GUARDS (Horse), in England, were gentlemen chosen for their bravery, to be entrusted with the guard of the king's person; and were divided into four troops, called the first, second, third, and fourth troops of horse guards. The first troop was raised in the year 1660, and the command given to lord Gerard; the second in 1661, and the command given to sir Philip Howard; the third in 1693, and the command given to earl Feversham; the fourth in 1792, and the command given to earl Newburgh.

GUARDS (Horse-Grenadier), are divided into two troops, called the first and second troops of horse-grenadier guards. The first troop was raised in 1693, and the command given to lieutenant-general Cholmondeley; the second in 1702, and the command given to lord Forbes.

GUARDS (Foot), are regiments of foot appointed for the guard of his majesty and his palace. There are three regiments of them, called the first, second, and third regiments of foot-guards. They were raised in the year 1660; and the command of the first given to colonel Russel, that of the second to general Monk, and the third to the earl of Linlithgow.

GUARD-BOAT, a boat appointed to row the rounds amongst the ships of war which are laid up in any harbour, &c. to observe that their officers keep a good look-out, calling to the guard-boat as she passes, and not suffering her crew to come on board, without having previously communicated the watch-word of the night.

GUARD-SHIP, a vessel of war appointed to superintend the marine affairs in a harbour or river, and to see that the ships which are not commissioned have their proper watch-word kept duly, by sending her guard-boats around them every night. She is also to receive seamen who are impressed in the time of war.

GUARDAFU, a cape of Abyssinia in Africa, at the entrance of the strait of Babel Mandel. Lat. 11. 46 N. Lon. 52. 5 E.

GUA'RDAGE. *s.* (from *guard.*) State of wardship: obsolete (*Shakspeare*).

GUA'RDER. *s.* One who guards.

GUARDIA, or GUARDA, an episcopal town of Beira, in Portugal. Lat. 40. 22 N. Lon. 6. 37 W.

GUARDIA ALFEREZ, an episcopal town of Naples, in Italy. Lat. 41. 39 N. Lon. 14. 56 E.

GUARDIAN, one appointed by the wisdom and policy of the law, to take care of a person and his affairs, who by reason of his imbecility and want of understanding is incapable of acting for his own interest; and it seems by our law, that his office originally was to instruct the ward in the arts of war, as well as those of husbandry and tillage, that when he came of age he might be the better able to perform those services to his lord, whereby he held his own land. 2 Bac. Abr. 672.

There are several kinds of guardians, as, guardian by nature, guardian by the common law, guardian by statute, guardian by custom,

guardian in chivalry, guardian in socage, and guardian by appointment of the lord chancellor.

Guardian by nature is the father or mother; and by the common law every father hath a right of guardianship of the body of his son and heir until he attains to the age of twenty-one years. This guardianship extends no further than the custody of the infant's person. The father may disappoint the mother, and other ancestors, of the guardianship by nature, by appointing a testamentary guardian under the statutes 4 and 5 Phil. and Mary, and 12 Char. II. A guardian by nature hath only the care of the person and education of the infant, and hath nothing to do with his lands, merely in virtue of his office; for such guardian may be, though the infant have no lands at all, which a guardian in socage cannot.

Guardian by the common law, or *Guardian in Socage*. If a tenant in socage die, his heir being under fourteen, whether he be his issue or cousin, male or female, the next of blood to the heir, to whom the inheritance cannot descend, shall be guardian of his body and land till fourteen; and although the nature of socage tenure is in some measure changed from what it originally was, yet it is still called socage tenure, and the guardian in socage is still only where lands of that kind, as most of the lands in England now are, descend to the heir within age; and though the heir after fourteen may choose his own guardian, who shall continue till he is twenty-one, yet as well the guardian before fourteen, as he whom the infant shall think fit to choose after fourteen, are both of the same nature, and have the same office, without any intervention or direction of the infant himself; they are to transact all affairs in their own name, and not in the name of the infant, which they would be obliged to do if their authority were derived from him.

This guardianship is so little resorted to, although all lands are now of socage tenure, that it is needless to enquire further into it here.

Guardian by statute, or *Testamentary Guardian*. By the common law, no person could appoint a guardian, because the law had appointed one, whether the father were tenant by knight service, or in socage.

The first statute that gave the father a power of appointing, was the 4 and 5 Philip and Mary, c. 8, which provides, under severe penalties, such as fine and imprisonment for years, against taking any maid, or woman child unmarried, being within the age of sixteen years, out of or from the possession, custody, or governance, and against the will of the father of such maid, or woman child, or of such person or persons, to whom the father of such maid, or woman child, by his last will and testament, or by any other act in his lifetime, shall grant the education and governance of such child.

But the principal guardianship is now by the statute 12 Car. II. c. 24, by which any father, under or of full age, may by deed or will, attested by two witnesses, appoint, dispose of the custody of his child born or unborn to any person except a popish recusant convict, either in possession or reversion till such child attain twenty-one. This guardian supersedes the guardian in socage, and has all actions which that guardian might have had. Besides which he has the care of the estate, real and personal. A father cannot under this statute appoint one to his natural child, and a case has been decided upon the marriage act, in which a marriage with consent of a guardian applied to a natural child was held void. The chancellor, however, will upon application appoint the same person guardian.

Guardians by custom, are appointed in the city of London, in the county of Kent, and with respect to copyhold lands in some manors.

Guardians by appointment of the ecclesiastical court, were appointed to take care of the infant's personal estate, till fourteen in males, and twelve in females; but their authority over the person is now denied, and they are only confined to guardianship for the purpose of a suit in an ecclesiastical court.

Guardian in chivalry, is obsolete, but extended to twenty-one years.

Guardian, by appointment of the lord chancellor. It is not easy to state how this jurisdiction was acquired; for it is certainly of no very ancient date, though now indisputable: for it is clearly agreed, that the king, as pater patriæ, is universal guardian of all infants, idiots, and lunatics, who cannot take care of themselves; and as this care cannot be exercised otherwise than by appointing them proper curarors or committees, it seems also agreed, that the king may, as he has done, delegate the authority to his chancellor; and that therefore at this day, the court of chancery is the only proper court that has jurisdiction in appointing and removing guardians, and in preventing them and others from abusing their persons or estates. 2 Inst. 14. And as the court of chancery is now vested with this authority, hence in every day's practice we find that court determining, as to the right of guardianship, who is the next of kin, and who the most proper guardian; as also orders are made by that court on petition or motion, for the provision of infants during any dispute therein; as likewise guardians removed or compelled to give security; they and others punished for abuses committed on infants, &c.

Guardian of the spiritualities, the person to whom the spiritual jurisdiction of any diocese is committed during the time the see is vacant. A guardian of the spiritualities may likewise be either such in law, as the archbishop is of any diocese within his province: or by delegation, as he whom the archbishop or vicar-general for the time appoints. Any such guardian has power to hold courts, grant licences, dispensations, probates of wills, &c.

GUA'RDIAN. *a.* Performing the office of a kind protector or superintendent (*Dryden*).

GUA'RDIANSHIP. *s.* (from *guardian.*) The office of a guardian (*L'Estrange*).

GUA'RDLESS. *a.* (from *guard.*) Without defence (*Waller*).

GUA'RDSHIP. *s.* (from *guard.*) 1. Care; protection (*Swift*). 2. (*guard* and *ship.*) A king's ship to guard the coast.

GUA'REA, in botany, a genus of the class octandria, order monogynia. Calyx four-toothed; petals four: nectary cylindrical, bearing the anthers at its mouth; capsule four-celled, four-valved; seeds solitary. One species: a West Indian tree, with lax, axillary racemes, and musky odour.

GUARIBA, in zoology. See SIMIA.

GUARINI, celebrated for being the first who taught Greek in Italy, was descended of an illustrious family of Verona, and died in 1460.

GUARINI (John Baptist), an illustrious Italian poet, great grandson of the preceding, was born at Ferrara, in 1537. He passed the greatest part of his life in courts; being in the service of Alphonso II. duke of Ferrara, and other princes, in which he seems to have been a prey to continual disgusts. Notwithstanding the celebrity of his Pastor Fido, he contemned the title of poet, which he thought beneath the dignity of a gentleman. He died at Venice in 1612.

GUARMA, a maritime town of Peru, in South America. Lat. 10. 10 S. Lon. 77. 49 W.

GUASTALLA, a strong town of Mantua, in Italy, 20 miles S. of Mantua. Lat. 44. 56 N. Lon 10. 38 E.

GUATIMALA, an audience of New Spain, in North America, in which are included twelve provinces.

GUATIMALA, a province of the above audience.

GUATIMALA, the principal town of the above province, and of the whole audience. It is the see of a bishop, and the seat of an university. On June 7. 1773, this town was swallowed up by an earthquake, together with about 8000 families. Soon after this dreadful catastrophe a new town was built at a little distance from the site of the old one, and is at present well peopled. Lat. 13. 40 N. Lon. 90. 30 W.

GUAVA, in botany. See PISIDIUM.

GUAVA (French). See CASSIA.

GUAXACA, a province of New Spain, in North America. It contains mines of gold, silver, and crystal.

GUAXACA, the capital of the above province, and the see of a bishop. Lat. 17. 45 N. Lon. 100. 0 W.

GUAW, in ornithology. See PENELOPE.

GUAYAQUIL, a seaport town of South America, in the audience of Quito, situated on a river near the Pacific Ocean, founded in the year 1533. The town is defended by three forts, two on the river, and one behind the town; 150 miles SSW. Quito, and 330 N. Truxillo. Lon. 59. 20 W. Lat. 2. 12 S.

GUBEN, a town of Lusatia, in Germany, seated on the river Neisse. Lat. 51. 58 N. Lon. 14. 39 E.

GUBER, a kingdom of Africa, in Negroland; seated on the banks of the Niger. Lat. 18. 15 N. Lon. 8. 30 E. The inhabitants are numerous; among them are many artificers and linen-weavers, who send their commodities to Tombuto.

GUBERNA'TION. *s.* (*gubernatio*, Lat.) Government; superintendency (*Watts*).

GUBIO, an episcopal town of the Ecclesiastical State, in Italy, 28 miles N. of Rome. Lat. 43. 16 N. Lon. 12. 38 E.

GU'DGEON, in ichthyology. See CYPRINUS.

This fish, though small, is of so pleasant a taste, that it is very little inferior to a smelt. Gudgeons spawn twice in the summer season, and their feeding is much like the barbels, in streams and on gravel, slighting all manner of flies; but they are easily taken with a small red worm, fishing near the ground; and being a leathern-mouthed fish, will not easily get off the hook when struck.

They are usually scattered up and down every river in the shallows in the heat of summer; but in autumn, when the weeds begin to grow sour, or rot, and the weather colder, they gather together, and get into the deeper parts of the water; and are to be fished for there, with your hook always touching the ground, if you fish with a float, or with cork; but many will fish for the gudgeon by hand, with a running-line upon the ground, without a cork, as a trout is fished for; and it is an excellent way, if you have a gentle rod, and as gentle a hand.

But although the small red worm is the best bait for this fish, yet wasps, gentles, and cadbaits, will do very well: you may also fish for gudgeons with two or three hooks at once, and find very pleasant sport, where they rise any thing large; when you angle for them, stir up the sand, or gravel, with a long pole; this will make them gather to that place, and bite faster and with more eagerness.

GUDGEON (Sea). See GOBIUS.

GUDGEON, signifies farther, 2. A man easily cheated (*Swift*). 3. Something to be caught to a man's own disadvantage; a bait (*Shakspeare*). 4. A pivot, on which something turns.

In vol. XI. of the Transactions of the Society for the Encouragement of Arts, &c. we have the following account of a gudgeon on an improved construction for the upright shafts of mills. "This gudgeon is formed of hard steel, and works on a hard steel bed; is circular, three inches in diameter, and three-fourths of an inch thick: from its upper side a rib projects, which being fixed in the bottom of an upright shaft, the gudgeon works horizontally on a square bed: and that now in the possession of the society has worked in a mill

whose wheel and shaft weighed nearly six tons; and though it had continued to work seven years, had lost very little of its surface. It ran in a square box of cast iron, having oil therein: and a notch along the whole of the face of the gudgeon admits the oil to insinuate itself between the gudgeon and the bed."

GUELDER ROSE, in botany. See Viburnum.

Guelder rose (Currant-leaved). See Spiræa.

Guelder rose (Virginian). See Spiræa.

GUELDERLAND, a territory of the Netherlands, bounded on the N. by Overissel and the Zuyder Sea, on the E. by the bishopric of Munster and the duchy of Cleves, on the S. by the duchy of Juliers and Brabant, and on the W. by the state of Utrecht and Holland. It was erected into a duchy in 1339. The town of Gueldres and its district belong to the king of Prussia; Ruremonde, and its dependencies, to the house of Austria; and Venlo and Stevenswaert to the United Provinces.

GUELDRES, a town of the duchy of Guelderland, ceded, with a considerable district, to Prussia. It is advantageously seated among marshes, on the river Niers, whose waters fill the ditches, and was formerly so strongly fortified as hardly to be taken except by famine. Lat. 51. 26 N. Lon. 6. 0 E.

GUELPHS, or Guelfs, a celebrated faction in Italy, antagonists of the Gibelins With respect to the origin of the name *Guelphs*, nothing satisfactory has yet been produced that we are aware of.

GUE'RDON. *s.* (*guerdon*, French.) A reward; a recompense: not used (*Knolles*).

GUERET, a town of France, in the department of Creuse, and late province of Marche, seated on the river Gartampe. Lat. 46. 10 N. Lon. 1. 56 E.

GUERICKE (Otto or Otho), counsellor to the elector of Brandenburg and burgomaster of Magdeburg, was born in 1602, and died in 1686 at Hamburg. He was one of the greatest philosophers of his time. It was Guericke that invented the air-pump; the two brass hemispheres, which being applied to each other, and the air exhausted, 16 horses were not able to draw them asunder; the marmouset of glass which descended in a tube in rainy weather, and rose again on the return of serene weather. This last machine fell into disuse on the invention of the barometer, especially after Huygens and Amontons gave theirs to the world. Guericke made use of his marmouset to foretell storms; from whence he was looked upon as a sorcerer by the people:—Guericke was author of several works in natural philosophy, the principal of which was his Experimenta Magdeburgica, in folio, which contains his experiments on a vacuum.

GUERNSEY, an island in the English Channel, about thirty miles in circumference; still governed by the laws of Normandy, of which it was anciently a part; and though subject to England, and declared to be in the county of Hants, and diocese of Winchester, the French language is universally made use of. The air is pure, and the inhabitants in general healthy and long lived. The soil is rich and fertile, the corn raised is enough for the island, and cattle are bred in sufficient quantities to victual their ships, with plenty of game and fowl. A lake, about a mile in circumference, situated in the north-west part of the island, is stored with excellent carp, and sea fish of various kinds are caught in plenty. The island is defended by a ridge of rocks, rugged and steep, from one of which is collected emery, or emeril, used by lapidaries and cutlers, to polish precious stones, steel, &c. The principal drink of the richer class is wine from France; of the inferior, cider, great quantities of which are made yearly from the abundant orchards in every part of the island. Coals are imported from England, and, through the scarcity of wood and fuel, the poor are compelled to burn sea-weed. When the reformation was first introduced into the island, the Genevan ritual was observed, but for a long time a translation of the Liturgy of the Church of England has been used universally. It is divided into ten parishes, with only eight churches. The convention of the states consists of a governor, coroners, jurats, clergy, and constable. The inhabitants carry on a considerable trade to Newfoundland and the Mediterranean. The staple manufacture is knit stockings. Port St. Pierre is the chief town. Lon. 2. 56 W. Lat. 49. 30 N.

Guernsey lily. See Amaryllis.

To GUESS. *v. n.* (*ghissen*, Dutch.) 1. To conjecture; to judge without any certain principles of judgment (*Raleigh*). 2. To conjecture rightly (*Stillingfleet*).

To Guess. *v. a.* To hit upon by accident.

Guess. *s.* (from the verb.) Conjecture; judgment without any positive or certain grounds (*Prior*).

GUE'SSER. *s.* (from *guess*.) Conjecturer; one who judges without certain knowledge.

GUE'SSINGLY. *ad.* (from *guessing*.) Conjecturally; uncertainly: not used (*Shakspeare*).

GUEST. *s.* (ȝeꞅt, ȝiꞅt, Saxon.) 1. One entertained in the house or at the table of another (*Luke*). 2. A stranger; one who comes newly to reside (*Sidney*).

GUE'STCHAMBER. *s.* Chamber of entertainment (*Mark*).

GUETTA'RDA. In botany, a genus of the class monœcia, order hexandria. Calyx cylindrical, very entire; corol funnel-form, six or seven-cleft, pistil one; drupe dry. Four species: natives of the West Indies.

To GU'GGLE. *v. n* (*gorgolaire*, Italian.) To sound as water running with intermissions out of a narrow-mouthed vessel.

GUGLIELMINI (Dominic), an eminent Italian mathematician and civil engineer, was descended from an honourable family, and born at Bologna in the year 1655. His favourite studies were the mathematics and medicine, in the former of which he had for tutor the celebrated M. Germ. Montanari; and in the latter, the illustrious Malpighi. He entered into the dispute between M. Montanari and M. Cavina,

concerning the extraordinary luminous meteor which was observed in most parts of Italy in 1676, and supported the opinions of his master. In the year 1678 he was admitted to the degree of doctor of medicine by the university of Bologna. Upon the appearance of the remarkable comet in the years 1680 and 1681, he published a treatise "De Cometarum Natura et Ortec," &c. 1681, in which he proposed a new system on the subject, which he thought would serve to explain all the phenomena of those heavenly bodies; but it did not meet with the approbation of the scientific world. His next astronomical treatise, containing remarks on the solar eclipse which took place on the 12th of July, 1684, and which he published in Latin, at Bologna, in the same year, reflected greater credit on his knowledge and accuracy of observation. Soon afterwards the senate of Bologna appointed him principal professor of mathematics in the university of that city, and, in the year 1686, created him intendant-general of the rivers of the Bolognese. The office last mentioned engaged him to pay more particular attention to the study of hydrostatics and hydraulics; in consequence of which, in the year 1690, he published the first part, and in the following year the second part, of an excellent hydrostatical treatise, entitled "Aquarum Fluentium Mensura, Novo Methodo Inquisita." Some of his observations in this work were attacked by M. Papin, who also entered into a contest with the author on the subject of syphons. Their difference in opinion gave rise to two letters by Guglielmini, which were printed under the title of "Epistolæ Duæ Hydrostaticæ." He was engaged in settling the differences which arose between the cities of Bologna and Ferrara respecting the management of the embankments and sluices in their contiguous districts; and received a reward of his services, from his native city, the appointment to a new office in the university, which was that of professor of hydrometry. In the year 1695 he assisted M. Cassini in repairing the famous meridian line which he had constructed forty years before in the church of St. Petronius, at Bologna; on which occasion our author published a memoir, descriptive of the method pursued in laying it down, and establishing its claims to correctness and accuracy. In the year 1697 he published his grand physico-mathematical treatise on the nature of rivers, entitled "Della Natura de Fiumi," which raised his reputation to the highest pitch, for correct scientific knowledge, ingenuity, and judgment in hydraulics. Montucla commends it in warm terms, and says that it ought to be carefully studied by every person who would wish to become thoroughly master of this branch of science. The reputation which Guglielmini acquired by this performance occasioned his being employed by the dukes of Mantua, of Parma, and Modena, the grand duke of Tuscany, pope Clement XI. the republics of Venice and Lucca, &c. in the invention and construction of the necessary hydraulic works in their respective territories. In the year 1698 he was induced, by the republic of Venice, to accept of the mathematical chair in the university of Padua; but the senate of Bologna decreed that he should still retain, notwithstanding his new employment, the title of professor in their university, and the emoluments annexed to it. In the year 1702, he exchanged his mathematical chair at Padua for the more lucrative one of medicine; after which he published different treatises on medical and chemical subjects, &c. He died at Padua in 1710, in the fifty-fifth year of his age. He had been admitted a member of the Academy of Sciences at Paris, in the year 1696, and was also associate, or corresponding member of the Academies of Berlin and Vienna, and of the Royal Society at London. The best edition of his treatise on the nature of rivers was published at Bologna in 1756, with the notes of Manfredi; and the whole of his works were printed in a collective form at Geneva, in 1719, in two volumes quarto. (*Brit. Ency.*).

GUGLINGEN, a town of Suabia, in the duchy of Wirtemberg, situate on the Zaber. Lat. 49. 2 N. Lon. 8. 56 E.

GUIANA, a country of South America, between the rivers Oronoko and Amazon, and to the E. of Peru. The interior parts of the country are inhabited by savages, who have different languages and customs; and some of them build their houses on trees, to be secure from the inundations of the rivers. The French possess a part of the coast, which is called Equinoctial France, and the Dutch another. Here is a perpetual spring, and it produces large quantities of sugar canes. It is between the equator and eight degrees of N. lat. See CAYENNE and SURINAM.

GUIDA, in music, the leading voice, or instrument, in fugues.

GUIDAGE. *s* (from *guide.*) The reward given to a guide (*Ainsworth*).

GUIDANCE. *s.* (from *guide.*) Direction; government (*Rogers*).

To GUIDE. *v. a.* (*guider*, French.) 1. To direct in a way (*South*). 2. To influence (*Kettlewell*). 3. To govern by counsel; to instruct (*Psalms*). 4. To regulate; to superintend (*Decay of Piety*).

GUIDE. *s.* (*guide*, French.) 1. One who directs another in his way (*Wisdom*). 2. One who directs another in his conduct. 3. Director; regulator (*Hooker*).

GUIDE, in music, the name given to that note in a fugue which leads off and announces the subject.

GUIDELESS. *a.* (from *guide.*) Having no guide; wanting a governour (*Dryden*).

GUIDER. *s.* (from *guide.*) Director; regulator; guide: obsolete (*South*).

GUIDO (Beni), an illustrious Italian painter, was born at Bologna in 1575. His father being a musician, intended him for the same profession; but conceiving an early attachment to the art of painting, he was placed under the tuition of Dennis Calvert, a Flemish master. He afterwards studied under the Ca-

racci, and soon acquired greater repute than any of his contemporaries. Honours were heaped upon him by several crowned heads, and riches flowed in upon him in abundance. He was unfortunate only in an immoderate love of gaming, which reduced him at length to such distress, that a languishing disease ensued, of which he died in 1642.

Guido, the musician. See Aretin.

GUIDON, in music, a direct.

GUIENNE, a late province of France, which now forms the department of Gironde, and that of Lot and Garonne.

GUILANDINA, in botany, bonduc or nicker-tree, a genus of the decandria monogynia class and order. Natural order of lomentaceæ. Leguminosæ, Jussieu. Essential character: calyx one-leafed; salver-shaped; petals five inserted into the neck of the calyx, nearly equal; seed vessel a legume. There are six species. The most remarkable are,

1. Bonduc, or yellow nickar.

2. Bonducella, or grey nickar. These are climbing plants, natives of the West Indies, where they rise to the height of twelve or fourteen feet: the flowers come out at the wings of the stalks, and are composed of five concave yellow petals. They are succeeded by pods about three inches long and two broad, closely armed with slender spines, opening with two valves, each inclosing two hard seeds, about the size of children's marbles, of a yellowish colour.

3. Moringa, or morunga nickar, is a native of the island of Ceylon, and some places on the Malabar coast. It rises to the height of twenty-five or thirty feet, having flowers produced in loose bunches from the sides of the branches, and composed of an unequal number of petals.

GUILD (from the Saxon *guildan*, to pay), signifies a fraternity or company, because every one was *gildare*, i. e. to pay something towards the charge and support of the company. As to the original of these guilds or companies: it was a law among the Saxons, that every freeman of fourteen years of age should find sureties to keep the peace, or be committed; upon which certain neighbours, consisting of ten families, entered into an association, and became bound for each other, either to produce him who committed an offence, or to make satisfaction to the injured party. That they might the better do this, they raised a sum of money among themselves, which they put into a common stock; and when one of their pledges had committed an offence, and was fled, then the other nine made satisfaction out of this stock, by payment of money, according to the offence. Because this association consisted of ten families, it was called a decennary: and from hence proceeded later kinds of fraternities.

Guild, in the royal boroughs of Scotland, is still used for a company of merchants, who are freemen of the borough. (See Borough). Every royal borough has a dean of guild, who is the next magistrate below the bailiff.

Guild, gild, or geld, is also used among our ancient writers for a compensation or mulct for a fault committed.

Guild-hall, the great hall of judicature for the city of London. In it are kept the mayor's court, the sheriff's court, the court of hustings, court of conscience, court of common council, chamberlain's court, &c. Here also the judges sit upon *nisi prius*, &c.

GUILE. *s.* (*guille*, old French.) Deceitful cunning; insidious artifice (*Milton*).

GUI'LEFUL. *a.* (*guile* and *full.*) 1. Wily; insidious; mischievously artful (*Dryden*). 2. Treacherous; secretly mischievous (*Shakspeare*).

GUI'LEFULLY. *ad.* (from *guileful.*) Insidiously; treacherously (*Milton*).

GUI'LEFULNESS. *s.* (from *guileful.*) Secret treachery; tricking cunning.

GUI'LELESS. *a.* (from *guile.*) Free from deceit; void of insidiousness; simply honest.

GUI'LER. *s.* (from *guile.*) One that betrays into danger by insidious practices (*Spenser*).

GUILFORD, a borough in Surry, with a market on Saturday. It is seated on the river Wey, and on the declivity of a hill. It had a large castle, of which some of the walls are still standing. The summer assizes for the county are alternately held here and at Croydon. Guilford contains 483 houses, and 2634 inhabitants. Lat. 51. 15 N. Lon. 0. 29 W.

GUILLEMOT, in ornithology. See Colymbus.

GUILLOTINE, an instrument calculated for the expeditious decapitation of criminals, and much used during the revolutionary murders committed lately in France. This machine consists of two upright posts, ten feet high, joined at the top by an horizontal piece of timber. At four feet from the bottom is a cross-bar, on which the neck of the criminal is laid, and over that there falls a similar bar, shaped to receive the neck like the front board of our pillory. On the inner faces of the frame are grooves, along which the extreme edges of an axe slide up and down. The axe is in shape somewhat like the italic capital letter *V*, the oblique stroke representing the sharp edge, which in falling, with a heavy mass of lead affixed to its upper part, severs the culprit's head from his body by a sliding cut. The upright side of the axe is wholly included in the groove which guides it, by means of a cord and pulley, up to a catch or pin, to which a separate cord is connected. The criminal is prepared for his fate by the executioner, who, having first cut off his hair, ties him in a standing posture to a board, which he afterwards inclines, so as to lay the body horizontally with the face downwards, and with the head advanced over a basket placed for its reception. The string being pulled by the executioner, the axe descends, and the head is severed in an instant. Louis XVI. his queen and aunt, and multitudes of persons of both sexes, and of all ranks, who were attached to the royal cause in France, suffered death in this way.

A similar machine once existed in England, but was confined in its use to the province of Hardwick, or the places within its precinct. The execution was generally at Halifax. This machine is now destroyed; but one of the same kind is in a room under the parliament-house at Edinburgh, where the use of it was introduced by the earl of Morton, who took a model of it as he passed through Halifax, and had the misfortune at length to suffer by it himself. In England and Scotland it is called a Maiden. Its name, La Guillotine, is taken from the name of the person who brought it into use in Paris, as at Lisle it is called Louison, for the same reason.

There are several engravings of this instrument to be seen; one in wood in 1520; another to a German translation of the works of Petrarch in 1520, and some others: in all which, the axe is straight or semicircular, but always horizontal.—The sloping position of the French axe appears the best for celerity of execution.

The guillotine, it farther appears, was an instrument used by the Romans under the name of Tympanum. Euphorion, of Chalcis, quoted by Athenæus, p. 154, tells us, that to be tympanized was to have your head cut off by an axe. According to Photius, the tympanum was a machine of wood, with which the criminal was struck and decollated.

Lequinio, the sentimental novelist of France, whom Mercier compares with the tender, the heart-touching Sterne—Lequinio, commissioner, sent by the National Assembly to regenerate Normandy and Brittany, wrote to his masters, that "he was very successful in conversions from superstition to sound reason." He opposed to the Bible and the relicts of the saints the constitution and the guillotine. "And you would wonder (says he) at my success—The wise (but they are few) give up their prejudices at once; but the multitude, the stupid worshippers of Notre Dame, look at our lady the guillotine; are silent, become serious, and their doubts vanish;—they are converted. This is your *labarum—in hoc signo vinces*" ! ! !

GUILT. *s.* (ʒılt, Saxon.) 1. The state of a man justly charged with a crime (*Hammond*). 2. A crime; an offence (*Shakspeare*).

GUI'LTILY. *ad.* (from *guilty.*) Without innocence (*Shakspeare*).

GUI'LTINESS. *s.* (from *guilty.*) The state of being guilty; consciousness of crime (*Sidney*).

GUI'LTLESS. *a.* (from *guilt.*) Innocent; free from crime (*Pope*).

GUI'LTLESSLY. *ad.* (from *guiltless.*) Without guilt; innocently.

GUI'LTLESSNESS. *s.* (from *guiltless.*) Innocence; freedom from crime (*King Charles*).

GUI'LTY. *a.* (ʒıltıʒ, Saxon.) 1. Justly chargeable with a crime; not innocent (*Shakspeare*). 2. Wicked; corrupt (*Thomson*).

GUINCAMP, a town of France, in the department of the North Coast Lat. 48. 36 N. Lon. 3 8 W.

GUINEA, a country of Africa, of which little is known except the coast, thence called the coast of Guinea. It is divided into the Lower and Upper. This last comprehends the Malaguetta coast, the Tooth coast, the Gold coast, Whidah, Great Adra, and Benin. The lower part is commonly called Congo. It is very unhealthy for Europeans, though the negroes live a considerable time. The water is so bad, that it often occasions worms, of a white silver colour, to breed between the skin and the flesh. The inhabitants in general go almost naked, and there seems to be little religion or honesty among them. The commodities purchased there are gum-seneca at Senegal; grain upon the Grain coast; elephant's teeth upon the Tooth coast; the greatest plenty of gold upon the Gold coast; and all, in general, furnish slaves, more or less: indeed, some of all these commodities are to be had in all parts of it. The English, Dutch, French, Danes, and other nations, have factories upon this coast, and purchase slaves and other commodities. There are abundance of little states, whose chiefs the sailors have dignified with the name of kings; but there are very few who deserve that title. When they are at war with each other, as they often are, the people taken, on both sides, are sold for slaves; and it is not uncommon for the nearest of kin to sell each other. These unnatural and horrid practices will probably continue, so long as guilty Europeans persevere in their odious traffic in human flesh.

GUINEA (New), an island of the S. Pacific ocean, to the N. of New Holland, from which it is separated by Endeavour Strait. The length of this strait, from N.E. to S.W. is ten leagues, and its breadth about five, except at the N.E. entrance, where it is contracted to somewhat less than two miles by the islands called Prince of Wales' Islands. Except this strait and the land of Cape Deliverance, the whole coast and the circumjacent islands seem to have been minutely examined both by the Dutch and Spaniards. Some traces of a passage between New Holland and New Guinea are also to be found in the accounts of former voyages; but captain Cook, in 1770, had the merit of establishing the fact beyond dispute. New Guinea was thus found to be a long narrow island, extending S.E. from the equator to 12 S. lat. and from 131 to 153 E. lon. The land in general is low, but covered with such luxuriance of wood and herbage as can scarcely be conceived. The cocoa-nut, the bread-fruit, and the plantain-tree, beside most of the trees, shrubs, and plants, that are common to all the South Sea islands, are found here in the greatest perfection. The inhabitants make much the same appearance as the New Hollanders.

GUINEA, an English gold coin, value twenty-one shillings. Its statute weight is 118·651 Troy grains. This coin took its denomination guinea, because the gold whereof the first was struck was brought from that part of Africa called Guinea; for which reason it

likewise at first bore the impression of an elephant.

Guinea-dropper, one who cheats by dropping guineas.

Guinea-hen, in ornithology. See Numidia.

Guinea pepper. See Piper Indicum.

Guinea-pig, in mastiology. See Cavia.

Guinea-worm, in helminthology. See Filaria.

GUINIAD, Gwiniad. This fish is excellent food, and is only found in a large water, called Pemble-mere: but the most remarkable circumstance is this, that the river which runs by Chester, has its head or fountain in Merionethshire, and its course runs through this Pemble-mere, which abounds as much with guiniads as the river Dee does with salmon, of each both affording great plenty; and yet it was never known that any salmon was ever caught in the Mere, or any guiniads taken in the river. See Salmo.

GUISE. *s.* (*guise*, French.) 1. Manner; mien; habit (*Fairfax*). 2. Practice; custom; property (*Ben Jonson*). 3. External appearance; dress (*Temple*).

Guise, a town of France, in the department of Aisne, with a strong castle, seated on the river Oise. Lat. 49. 54 N. Lon. 3. 42 E.

Guise (Henry, duke of), was born in 1550. He was a good soldier; but of a haughty and turbulent temper. He formed the rebellious association called the League, the plan of which was projected by his uncle, the cardinal of Lorrain. The league was formed on the pretence of defending the Roman catholic religion, and the liberty of the state. With its aid, the duke of Guise long controlled Henry III. and was even in open rebellion against him. On the celebrated day of the Barricades, Henry having escaped from the hands of the duke to Blois, convened the states there; and the duke of Guise having the boldness to appear to a summons sent him on the occasion, was assassinated.

Guise (Charles, duke of), eldest son of the preceding, was born in 1571. He was arrested on the day of his father's death, and shut up in the castle of Tours, from which he escaped in 1592. Proceeding to Paris, he was received with the greatest demonstrations of joy by the partisans of the league. He finally made his peace with the king; but cardinal Richelieu long after, dreading his power, compelled him to quit France. He died at Cuna, in Italy, in 1640.

GUITAR, or Guitarra. A stringed instrument, the body of which is of an oval-like form, and the neck similar to that of a violin. The strings, which are distended in parallel lines from the head to the lower end, passing over the sounding-hole and bridge, are tuned to the C above fiddle G, E its third, G its fifth, and their octaves. The intermediate intervals are produced by bringing the strings, by the pressure of the fingers of the left-hand, into contact with the frets fixed on the key-board, while those of the right agitate the strings, and mark the measure.

This instrument was first used in Spain and Italy. The Spaniards are so fond of the guitar, that there is scarcely an artificer who cannot play it; and the men of almost all orders make use of this instrument in the evenings to serenade their mistresses.

GULA, in architecture, the same as *cymatium* and *ogee*.

Gula, in anatomy. See Œsophagus.

GULBE, in architecture, the same as *gorge*.

GULCH. Gu'lchin. *s.* (from *gulo*, Lat.) A little glutton (*Skinner*).

GULES, in heraldry, signifies the colour red, which is expressed in engraving by perpendicular lines falling from the top of the escutcheon to the bottom.

GULPH, or Gulf, in geography, an arm or part of the ocean, running up with the land, and forming a capacious bay between two promontories. The word comes from the French *golfe*, and that from the Italian *golfo*, which signify the same. This word is also applied in other senses, as, 2. An abyss; an immeasureable depth (*Spenser*). 3. A whirlpool; a sucking eddy (*Shakspeare*). 4. Any thing insatiable (*Shakspeare*).

GU'LFY. *a.* (from *gulf*.) Full of gulfs or whirlpools (*Pope*).

To GULL. *v. a.* (*guiller*, Fr.) To trick; to cheat; to defraud; to deceive (*Dryden*).

Gull. *s.* (from the verb.) 1. A sea bird. (See Larus). 2. A cheat; a fraud; a trick (*Shakspeare*). 3. A stupid animal; one easily cheated (*Shakspeare*).

GU'LLCATCHER. *s.* (*gull* and *catch*.) A cheat; a man of trick (*Shakspeare*).

GU'LLER. *s.* (from *gull*.) A cheat; an impostor.

GU'LLERY. *s.* (from *gull*.) Cheat; imposture (*Ainsworth*).

GU'LLET. *s.* (*goulet*, French.) 1. The throat; the œsophagus (*Denham*). 2. A small stream or lake (*Heylin*).

To GU'LLY. *v. n.* To run with noise.

GU'LLYHOLE. *s.* The hole where the gutters empty themselves in the subterraneous sewer.

GULO'SITY. *s.* (*gulosus*, Lat.) Greediness; gluttony; voracity (*Brown*).

To GULP. *v. a.* (*golpen*, Dut.) To swallow eagerly; to suck down without intermission (*Gay*).

Gulp. *s.* (from the verb.) As much as can be swallowed at once (*More*).

GUM. (*gummi*.) Mucilage. This substance is very abundant in the vegetable kingdom: it is found in a great number of roots; and the shoots of plants and new leaves contain it in great abundance. It may be known by its viscous and adhesive quality when pressed between the fingers. At the time of the year when the juices of plants are the most abundant, it naturally exudes through the barks of trees, and thickens on the surface into gum. The characters of gum are, 1. Solubility in water, to which it gives a thick and viscous

consistence. This solution, known by the name of mucilage, becomes dry, transparent, and brittle, by evaporation. 2. Insolubility in alcohol. 3. Coagulation by the action of weak acids. There are only two gums in use in medicine, viz. gummi arabicum, and tragacantha. Mucilages, of the same nature as gums, are obtained also from many plants, as mallows, quince-seeds, linseed, &c.

Gum is truly a vegetable production: the only instance in which it is found secreted by animals, being the poison discharged from the hollow tusk of the viper and other serpents. Gum lac is also an animal secretion; but then as the plaso, and one or two other trees on which the coccus ficus, from whose labours we obtain it, fixes itself, produce by incision a lac of a similar kind, it seems rather already prepared for the insect than an original preparation of its own.

GUM ELEMI, in botany. See AMYRIS.

GUM TREE, in botany. See PISTACHIA.

GUM (Sweet), in botany. See LIQUIDAMBAR.

GUM TRAGACANTH, in botany. See ASTRAGALUS and TRAGACANTHA.

GUM ARABIC, in botany. See MIMOSA.

GUM GALBANUM, in botany, See BUBON.

To GUM. *v. a.* To close with gum.

GUM BOIL. See PARULIS.

GUM-RESIN. This also, like pure gum, is an exudation from a great variety of plants, yet chiefly of tropical climates. It constitutes a very considerable proportion of their juices; and oozes out from natural cracks in the bark, or artificial incisions; and hardens, like the purer gums, into irregular roundish masses, under the influence of the sun and air. A similar juice to that which is thus thrown forth naturally from the surface may be obtained, but inferior in its quality, by macerating some plants in water; the whole plant being employed, or that part of it which yields the gum-resinous matter, the water being afterwards evaporated to an extract.

Gum-resins are almost exclusively confined to medical practice; and amongst the most important of them may be enumerated myrrh, galbanum, assafœtida, ammoniacum, olibanum, sagapenum, and perhaps opium. The general or characteristic properties of a gum-resin, are (as its name indeed imports) such as may be expected to be produced by a natural mixture of gum and resin. To the resinous part they chiefly owe the property of burning with much flame, melting in drops by the heat; of giving by distillation a large portion of volatile oil, and some ammonia. To the gummy part they owe their partial solubility in water, so that when rubbed with this fluid they form an emulsion, generally whitish, which remains a considerable time turbid; and even when by rest the gum-resin has subsided, the clear liquor always retains some of the taste and smell of the substance employed.

Several of the gum-resinous juices are also mixed with a kind of extractive, or a coloured and bitter substance, soluble in water and alcohol. Tar is also frequently combined with them, sometimes in very considerable quantities.

GUMMI ACA'NTHIUM, an obsolete name of the gum arabic.

GUMMI ADSTRINGENS. See KINO.

GUMMI AMMONI'ACUM. See AMMONIACUM.

GUMMI A'NIME, in botany. See ANIME and HYMENÆA.

GUMMI ARA'BICUM. See ARABICUM GUMMI.

GUMMI BDE'LLIUM. See BDELLIUM.

GUMMI CARA'NNÆ. See CARANNA.

GUMMI CERASO'RUM, the juice which exudes from cherry-trees. It is very similar to gum arabic, for which it may be substituted.

GUMMI CHI'BOU, a spurious kind of gum elemi.

GUMMI COU'RBARIL. An epithet sometimes applied to the juice of the hymenæa courbaril. See ANIME.

GUMMI EUPHO'RBII. See EUPHORBIUM.

GUMMI GA'LDA. See GALDA.

GUMMI GAMBIE'NSE. See KINO.

GUMMI GU'TTÆ. See GAMBOGIA.

GUMMI HE'DERÆ. Ivy gum. The resinous juice of the hedera helix of Linnéus, or ivy. It is imported from the East Indies, though it may be collected from trees in this country. It is brought over in hard compact masses, externally of a reddish brown colour, internally of a bright brownish yellow, with reddish specks or veins. It has a strong, resinous, agreeable smell, and an adstringent taste. Though never used in the practice of the present day, it possesses corroborant, adstringent, and antispasmodic virtues.

GUMMI JUNIPERI'NUM. See SANDARACK.

GUMMI KIKEKUNE'MALO. See KIKEKUNEMALO.

GUMMI KI'NO. See KINO.

GUMMI LA'CCÆ. See LACCA.

GUMMI MY'RRHÆ. See MYRRHA.

GUMMI SAGA'PENUM. See SAGAPENUM.

GUMMI SENEGALE'NSE. This is a true gum, brought from the island of Senegal on the coast of Africa, where it exudes in large pieces from the mimosa senegal of Linnéus. It is similar in virtue and quality to the gum arabic, and the gum which exudes in this climate from the cherry-trees.

GUMMI TRAGACA'NTHÆ. See TRAGACANTHA and ASTRAGALUS.

GU'MMINESS. *s.* The state of being gummy; accumulation of gum (*Wiseman*).

GUMMO'SITY. *s.* (from *gummous.*) The nature of gum; gumminess (*Floyer*).

GU'MMOUS. *a.* (from *gum.*) Of the nature of gum (*Woodward*).

GU'MMY. *a.* (from *gum.*) 1. Consisting of gum; of the nature of gum (*Dryden*). 2.

Productive of gum (*Milton*). 3. Overgrown with gum (*Dryden*).

GUMS. (*gingivæ.*) In anatomy, the very vascular and elastic substance that covers the alveolar arches of the upper and under jaws, and embraces the necks of the teeth.

GUN, a fire arm or weapon of offence, which forcibly discharges a ball, shot, or other offensive matter, through a cylindrical barrel, by means of gunpowder. Gun is a general name, under which are included divers or even most species of fire arms. They may be divided into great and small.

Great guns, called also by the general name cannons, make what we also call ordnance or artillery; under which come the several sorts of cannon. (See CANNON, ARTILLERY, &c.) For small guns, see FOWLING-PIECE and MUSKET.

GUN is also a name given to an instrument used by miners in cleaving rocks with gunpowder. It is an iron cylinder of an inch and a half thick, and about six inches long; and having a flat side to receive the side of a wedge; and a hole drilled through it to communicate with the inside of the hole in the rock: this hole is made about eight inches deep, and in the bottom of it is put about two or three ounces of gunpowder: then this gun is driven forcibly in, so as to fill up the hole, and the wedge is driven in on its flat side to secure it. The priming at the hole is then fired by a train, and the orifice being so well stopped by this gun, the force of the powder is determined to the circumadjacent parts of the rock, which it splits.

GUNDELIA, in botany, a genus of the class syngenesia, order polygamia segregata. Calycleless; but the cells of the receptacle five-flowered; florets tubular, male, and hermaphrodite; receptacle chaffy; downless. One species; a milky plant of Armenia, with alternate, prickly leaves, and terminal flowers.

GUNFLINTS. For an interesting memoir on the art of making gunflints, by M. Dolomieu, much too long for our limits, see Nicholson's Journal, No. 2. N. S.

GUNNEL. See GUNWALE.

GUNNER, an officer appointed for the service of the cannon; or one skilled to fire the guns. In the Tower of London, and other garrisons, as well as in the field, this officer carries a field staff, and a large powder horn in a string over his left shoulder; he marches by the guns, and when there is any apprehension of danger, his field staff is armed with match; his business is to lay the gun to pass, and to help to load and traverse her.

GUNNER OF A SHIP, or MASTER-GUNNER, has the charge of all the ordnance the ship carries, to see that they be serviceably mounted, and sufficiently supplied with sponges, ladles, and rammers; that in foul weather they be traversed within board, especially those of the lower tier, and that the ports be shut, and caulked up; and that at all times they may be well lashed, and made fast, lest any of them break loose, to the imminent danger of foundering the ship. In the time of an engagement, the gunner is to see that every piece be sufficiently manned; he is answerable to give an account of all his charge upon demand. He has a mate and quarter-gunners for his assistance.

GUNNER (Master), a patent-officer of the ordnance, who is appointed to teach all such as learn the art of gunnery, and to certify to the master-general the ability of any person recommended to be one of the king's gunners. To every scholar he administers an oath, not to serve, without leave, any other prince or state; or teach any one the art of gunnery, but such as have taken the said oath. The present master-gunner of England is brigadier-general Macleod.

GUNNERA, in botany, a genus of the class gymnandria, order diandria. Calyx two-toothed; corolless; drupe somewhat fleshy, crowned with the calyx growing to it. Three species; Cape, Magellan's Straits, Chili.

GUNNERY, the art of charging, directing, and exploding all kinds of fire-arms, as cannon, mortars, muskets, &c. to the best advantage. Gunnery is sometimes considered as a part of the military art, and sometimes as a part of pyrotechny. To the art of gunnery too belongs the knowledge of the force and effect of gunpowder, the dimensions of the pieces, and the proportions of the powder and ball they carry, with the methods of managing, charging, pointing, sponging, &c. Also some parts of gunnery are brought under mathematical consideration, which among mathematicians are called absolutely by the name *Gunnery*, viz. the rules and method of computing the range, elevation, quantity of powder, &c. so as to hit a mark or object proposed, and is more particularly called projectiles. See PROJECTILES.

Long before the invention of gunpowder, and of gunnery properly so called, the art of artillery, or projectiles, was actually in practice. For not to mention the use of spears, javelins, or of stones thrown with the hand, or of bows and arrows, all which are found among the most barbarous and ignorant people, accounts of the larger machines for throwing stones, darts, &c. are recorded by the most ancient writers. Thus one of the kings of Judah, 800 years before the Christian æra, erected engines of war on the towers and bulwarks of Jerusalem, for shooting arrows and great stones for the defence of the city. 2 Chron. xxvi. 15. Such machines were afterwards known among the Greeks and Romans by the names of Ballista, Catapulta, &c. which produced effects by the action of a spring of a strongly twisted cordage, formed of tough and elastic animal substances, no less terrible than the artillery of the moderns. Such warlike instruments continued in use down to the 12th and 13th centuries, and the use of bows still longer; nor is it probable that they were totally laid aside till they were superseded by gunpowder and the modern ordnance.

The first application of gunpowder to military affairs, it seems, was made soon after the year 1300, for which the proposal of friar Bacon about the year 1280, for applying its enormous explosion to the destruction of armies, might give the first hint; and Schwartz might have been the first who actually applied it in this way, that is, in Europe; for as to Asia, it is probable that the Chinese and Indi-

ans had something of this kind many ages before. Thus, only to mention the prohibition of fire-arms in the code of Gentoo laws, printed by the East India Company in 1776, which seems to confirm the suspicion suggested by a passage in Quintus Curtius, that Alexander the Great found some weapons of that kind in India: cannon in the Shanscrit idiom is called *Shetaghnee*, or the weapon that kills a hundred men at once.

However, the first pieces of artillery, which were charged with gunpowder and stone bullets of a prodigious size, were of very clumsy and inconvenient structure and weight. Thus when Mahomet the Second besieged Constantinople in 1453, he battered the walls with stones of this kind, and with pieces of the calibre of 1200 pounds; which could not be fired more than four times a day. It was however soon discovered that iron bullets, of much less weight than stone ones, would be more efficacious if impelled by greater quantities of stronger powder. This occasioned an alteration in the matter and form of the cannon, which were now cast of brass. These were lighter and more manageable than the former, at the same time that they were stronger in proportion to their bore. This change took place about the close of the fifteenth century.

By this means came first into use such powder as is now employed all over Europe, by varying the proportion of the materials. But this change of the proportion was not the only improvement it received. The practice of graining is doubtless of considerable advantage. At first the powder had been always used in the form of fine meal, such as it was reduced to by grinding the materials together. And it is doubtful whether the first graining of the powder was intended to increase its strength, or only to render it more convenient for filling into small charges and the charging of small arms, to which alone it was applied for many years, whilst meal powder was still used for cannon. But at last the additional strength which the grained powder was found to possess, doubtless from the free passage of the air between the grains, occasioned the meal powder to be entirely laid aside.

For the last 200 years, the formation of cannon has been very little improved; the best pieces of modern artillery differing little in their proportion from those used in the time of Charles the Fifth. Indeed lighter and shorter pieces have been often proposed and tried; but though they have their advantages in particular cases, it is agreed they are not sufficient for general service. Yet the size of the pieces has been much decreased; the same purposes being now accomplished by smaller pieces than what were formerly thought necessary. Thus the battering cannon now approved are those that formerly were called demi-cannon, carrying a ball of 24 pounds weight, this weight having been found fully sufficient. The method also of making a breach, by first cutting off the whole wall as low as possible before its upper part is attempted to be beaten down, seems to be a considerable modern improvement in the practical part of gunnery. But the most considerable improvement in the practice is the method of firing with small quantities of powder, and elevating the piece but a little, so that the bullet may just go clear of the parapet of the enemy, and drop into their works, called ricochet firing: for by this means the ball, coming to the ground at a small angle, and with a small velocity, does not bury itself, but bounds or rolls along a great way, destroying all before it. This method was first practised by M. Vauban at the siege of Aeth, in the year 1692. A practice of this kind was successfully practised by the king of Prussia at the battle of Rosbach in 1757. He had several six-inch mortars, made with trunnions, and mounted on travelling carriages, which were fired obliquely on the enemy's lines, and among their horse. These being charged with only 8 ounces of powder, and elevated at one degree and a quarter, did great execution: for these shells rolling along the lines with burning fuses, made the stoutest of the enemy not wait for their bursting.

The use of fire-arms was however long known before any theory of projectiles was formed. The Italians were the first people that made any attempts at the theory, which they did about the beginning of the 16th century, and amongst them it seems the first who wrote professedly on the flight of cannon shot was Nicholas Tartalia, of Brescia, the same author who had so great a share in the invention of the rules for cubic equations. In 1537 he published at Venice his *Nova Scientia*, and in 1546 his *Quesiti et Inventioni diversi*, in both which he treats professedly on these motions, as well as in another work, translated into English with additions by Cyprian Lucar, under the title of Colloquies concerning the Art of Shooting in great and small Pieces of Artillery, and published at London in 1588. He determined that the greatest range of a shot was when discharged at an elevation of 45°: and he asserted, contrary to the opinion of his contemporaries, that no part of the path described by a ball is a right line; although the curvature in the first part of it is so small that it need not be attended to. He compared it to the surface of the sea; which, though it appears to be a plane, is yet doubtless incurvated round the centre of the earth. He says he invented the gunner's quadrant, for laying a piece of ordnance to any point or degree of elevation; and though he had but little opportunity of acquiring any practical knowledge by experiments, he yet gave shrewd guesses at the event of some untried methods.

The philosophers of those times also took part in the questions arising upon this subject; and many disputes on motion were held, especially in Italy, which continued till the time of Galileo, and probably gave rise to his celebrated Dialogues on Motion. These were not published till the year 1638; and in the interval there were published many theories of the motion of military projectiles as well as many tables of their comparative ranges; though for the most part very fallacious, and inconsistent with the motions of these bodies.

It is remarkable however that, during these contests, so few of those who were intrusted with the care of artillery thought it worth while to bring their theories to the test of experiment. Mr. Robins informs us, in his preface to his New Principles of Gunnery, that he had met with no more than four authors who had treated experimentally on this subject. The first of these is Collado in 1642, who has given the ranges of a falconet, carrying a three-pound shot, to every point of the gunner's quadrant, each point being the 12th part, or 7° and a half. But from his numbers it is manifest that the piece was not charged with its usual allotment of powder. The result of his trials shews the ranges at the point-blanc, and the several points of elevations as below.

Collado's Experiments.

Elevation at Points.		Deg.	Range in paces.
0	or	0	268
1		7½	594
2		15	794
3		22½	954
4		30	1010
5		37½	1040
6		45	1053
7		52½	between the 3d and 4th
8		60	between the 2d and 3d
9		67½	between the 1st and 2d
10		75	between the 0 and 1st
11		82½	fell very near the piece.

The next was by Wm. Bourne, in 1643, in his Art of Shooting in great Ordnance. His elevations were not regulated by the points of the gunner's quadrant, but by degrees; and he gives the proportions between the ranges at different elevations and the extent of the point-blanc shot, thus: if the extent of the point-blanc shot be represented by 1, then the proportions of the ranges at several elevations will be as below, viz.

Bourne's Proportion of Ranges.

Elevation.	Range.
0°	1
5	2⅔
10	3¼
15	4¼
20	4⅚
and the greatest random	5½;

which greatest random, he says, in a calm day is at 42° elevation; but according to the strength of the wind, and as it favours or opposes the flight of the shot, the elevation may be from 43° to 36°. He does not say with what piece he made his trials, though from his proportion it seems to have been a small one. This however ought to have been mentioned, as the relation between the extent of different ranges varies extremely according to the velocity and density of the bullet.

After him Eldred and Anderson, both Englishmen, also published treatises on this subject. The former of these was many years gunner of Dover castle, where most of his experiments were made, the earliest of which are dated 1611, though his book was not published till 1646, and was entitled *The Gunner's Glass*. His principles were sufficiently simple, and within certain limits very near the truth, though they were not rigorously so. He has given the actual ranges of different pieces of artillery at small elevations, all under 10 degrees. His experiments are numerous, and appear to be made with great care and caution; and he has honestly set down some, which were not reconcileable to his method: upon the whole he seems to have taken more pains, and to have had a juster knowledge of his business, than is to be found in most of his practical brethren.

Galileo printed his Dialogues on Motion in the year 1646. In these he pointed out the general laws observed by nature in the production and composition of motion, and was the first who described the actions and effects of gravity on falling bodies: on these principles he determined, that the flight of a cannon shot, or of any other projectile, would be in the curve of a parabola, unless so far as it should be diverted from that track by the resistance of the air. He also proposed the means of examining the inequalities which arise from thence, and of discovering what sensible effects that resistance would produce in the motion of a bullet at some given distance from the piece.

Notwithstanding these determinations and hints of Galileo, it seems that those who came after him never imagined that it was necessary to consider how far the operations of gunnery were affected by this resistance. Instead of this, they boldly asserted, without making the experiment, that no great variation could rise from the resistance of the air in the flight of shells or cannon-shot. In this persuasion they supported themselves chiefly by considering the extreme rarity of the air, compared with those dense and ponderous bodies; and at last it became an almost generally established maxim, that the flight of these bodies was nearly in the curve of a parabola.

Thus Robert Anderson, in his *Genuine Use and Effects of the Gunne* published in 1674, and again in his book *To hit a Mark* in 1690, relates a great many experiments; but proceeding on the principles of Galileo, he strenuously asserts that the flight of all bullets is in the curve of a parabola; undertaking to answer all objections that could be brought to the contrary. The same thing was also undertaken by Blondel, in his *Art de jetter les Bombes*, published in 1683; where, after long discussions, he concludes, that the variations from the air's resistance are so slight as not to deserve any notice. The same subject is treated of in the Philos. Trans. No. 216, p. 68, by Dr. Halley, who also, swayed by the very great disproportion between the density of the air and that of iron or lead, thought it reasonable to believe that the opposition of the air to large metal-shot is scarcely discernible; although in small and light shot he owns that it must be accounted for.

But though this hypothesis went on smoothly in speculation, yet Anderson, who made a great number of trials, found it impossible to support it without some new modification. For though it does not appear that he ever examined the comparative ranges of either cannon or musket shot when fired with their usual velocity, yet his experiments on the ranges of shells thrown with velocities that were but small in comparison of those above mentioned, convinced him that their whole track was not parabolical. But instead of making the proper inferences from hence, and concluding that the resistance of the air was of considerable efficacy, he framed a new hypothesis; which was, that the shell or bullet at its first discharge flew to a certain distance in a right line, from the end of which line only it began to describe a parabola: and this right line, which he calls the line of the impulse of the fire, he supposes is the same for all elevations. So that, by assigning a proper length to this line of impulse, it was always in his power to reconcile any two shots made at any two different angles; though the same method could not succeed with three shots; nor indeed does he ever inform us of the event of his experiments when three ranges were tried at one time.

But after the publication of Newton's Principia, it might have been expected that the defects of the theory would be ascribed to their

true cause, which is the great resistance of the air to such swift motions; as in that work he particularly considered the subject of such motions, and related the result of experiments, made on slow motions at least; by which it appeared, that in such motions the resistance increases as the square of the velocities, and he even hints a suspicion that it will increase above that law in swifter motions, as is now known to be the case. So far however were those who treated this subject scientifically from making a proper allowance for the resistance of the atmosphere, that they still neglected it, or rather opposed it, and their theories still differed most egregiously from the truth. Huygens alone seems to have attended to this principle: for in the year 1590 he published a treatise on gravity, in which he gave an account of some experiments tending to prove that the track of all projectiles, moving with very swift motions, was widely different from that of a parabola. The rest of the learned generally acquiesced in the justness and sufficiency of Galileo's doctrine, and accordingly very erroneous calculations concerning the ranges of cannon were given. Nor was any farther notice taken of these errors till the year 1716, at which time Mr. Ressons, a French officer of artillery, of great merit and experience, gave in a memoir to the Royal Academy, importing that, "although it was agreed that theory joined with practice did constitute the perfection of every art; yet experience had taught him that theory was of very little service in the use of mortars: that the works of M. Blondel had justly enough described the several parabolic lines according to the different degrees of the elevation of the piece: but that practice had convinced him there was no theory in the effect of gunpowder; for having endeavoured, with the greatest precision, to point a mortar according to these calculations, he had never been able to establish any solid foundation upon them." One instance only occurs, in which D. Bernoulli applies the doctrine of Newton to the motions of projectiles, in the Com. Acad Petrop. tom. 2. p. 338, &c. Besides which nothing farther was done in this business till the time of Mr. Benjamin Robins, who published a treatise in 1742, intitled New Principles of Gunnery, in which he treated particularly not only of the resistance of the atmosphere, but also of the force of gunpowder, the nature and effects of different guns, and almost every thing else relating to the flight of military projectiles; and indeed he carried the theory of gunnery nearly to its utmost perfection.

The first thing considered by Mr. Robins, and which is indeed the foundation of all other particulars relating to gunnery, is the explosive force of gunpowder. M. de la Hire, in his Hist. of the Acad. of Sciences for the year 1702, supposed that this force may be owing to the increased elasticity of the air contained in and between the grains, in consequence of the heat and fire produced at the time of the explosion: a cause not adequate to the 200th part of the effect. On the other hand, Mr. Robins determined, by irrefragable experiments, that this force was owing to an elastic fluid similar to our atmosphere, existing in the powder in an extremely condensed state, which being suddenly freed from the powder by the combustion, expanded with an amazing force, and violently impelled the bullet, or whatever might oppose its expansion.

The intensity of this force of exploded gunpowder Mr. Robins ascertained in different ways, after the example of Mr. Hawksbee, related in the Philos. Trans. No. 295, and in his Physico-Mechan. Exper. p. 81. One of these is by firing the powder in the air thus: A small quantity of the powder is placed in the upper part of a glass tube, and the lower part of the tube is immerged in water, the water being made to rise so near the top, that only a small portion of air is left in that part where the powder is placed: then in this situation the communication between the upper part of the tube and the external air being closed, the powder is fired by means of a burning glass, or otherwise; the water descends upon the explosion, and stands lower in the tube than before, by a space proportioned to the quantity of powder fired.

Another way was by firing the powder in vacuo, viz. in an exhausted receiver, by dropping the grains of powder upon a hot iron included in the receiver. By this means a permanent elastic fluid was generated from the fired powder, and the quantity of it was always in proportion to the quantity of powder that was used, as was found by the proportional sinking of the mercurial gage annexed to the air pump. The result of these experiments was, that the weight of the elastic air thus generated was equal to $\frac{3}{10}$ of the compound mass of the gunpowder which yielded it, and that its bulk when cold and expanded to the rarity of the common air, was about 240 times the bulk of the powder; and consequently in the same proportion would such fluid at first if it were cold exceed the force or elasticity of the atmosphere. But as Mr Robins found by another ingenious experiment, that air heated to the extreme degree of the white heat of iron has its elasticity quadrupled, or is 4 times as strong; he thence inferred that the force of the elastic air generated as above, at the moment of the explosion, is at least 4 times 240, or 960, or in round numbers about 1000 times as strong as the elasticity or pressure of the atmosphere on the same space.

Having thus determined the force of the gunpowder, or intensity of the agent by which the projectile is to be urged, Mr. Robins next proceeds to determine the effects it will produce, or the velocity with which it will impel a shot of a given weight from a piece of ordnance of given dimensions; which is a problem strictly limited, and perfectly soluble by mathematical rules, and is in general this: Given the first force, and the law of its variation, to determine the velocity with which it will impel a given body, in passing through a given space which is the length of the bore of the gun.

In the solution of this problem Mr. Robins assumes these two postulates, viz. 1, That the action of the powder on the bullet ceases as soon as the bullet is out of the piece; and 2d, That all the powder of the charge is fired and converted into elastic fluid before the bullet is sensibly moved from its place: assumptions which for good reasons are found to be in many cases very near the truth. It is to be noted also, that the law by which the force of the elastic fluid varies is this, viz. that its intensity is directly as its density, or reciprocally proportional to the space it occupies, being so much the stronger as the space is less: a principle well known, and common to all elastic fluids. Upon these principles then Mr. Robins resolves this problem, by means of the 39th prop. of Newton's Principia,

in a direct way, and the result is equivalent to this theorem, when the quantities are expressed by algebraic symbols; viz. the velocity of the ball.

$$v = 27130\sqrt{\frac{10a}{cd} \times \log.\frac{b}{a}}$$

$$\text{or} = 100\sqrt{\frac{223ad^2}{w} \times \log.\frac{b}{a}};$$

where v is the velocity of the ball,
a the length of the charge of powder,
b the whole length of the bore,
c the spec. grav. of the ball, or wt. of a cubic foot, of the same matter in ounces,
d the diam. of the bore,
w the wt. of the ball in ounces.

For example, suppose $a = 2\frac{5}{8}$ inc., $b = 45$ inches, $c = 11345$ oz. for a ball of lead, and $d = \frac{3}{4}$ inches; then $v = 27150\sqrt{\frac{7}{2269} \times \log.\frac{120}{7}}$ $= 1674$ feet per second, the velocity of the ball.

Or, if the wt. of the bullet be $w = 1\frac{9}{20}$ oz. $= \frac{29}{20}$ oz. Then $v = 100\sqrt{\frac{1115 \times 189}{29 \times 32} \times \log.\frac{120}{7}}$ $= 1674$ feet, as before.

"Having in this proposition (says Mr. Robins) shewn how the velocity which any bullet acquires from the force of powder, may be computed upon the principles of the theory laid down in the preceding propositions, we shall next shew that the actual velocities with which bullets of different magnitudes are impelled from different pieces with different quantities of powder, are really the same with the velocities assigned by these computations, and consequently that this theory of the force of powder, here delivered, does unquestionably ascertain the true action and modification of this enormous power,

"But in order to compare the velocities communicated to bullets by the explosion with the velocities resulting from the theory by computation, it is necessary that the actual velocities with which bullets move should be capable of being discovered, which yet is impossible to be done by any methods hitherto made public. The only means hitherto practised by others for that purpose have been either by observing the time of the flight of the shot through a given space, or by measuring the range of the shot at a given elevation, and thence computing on the parabolic hypothesis what velocity would produce this range. The first method labours under this insurmountable difficulty, that the velocities of these bodies are often so swift, and consequently the time observed is so short, that an imperceptible error in that time may occasion an error in the velocity thus found, of 2, 3, 4, 5, or 600 feet in a second. The other method is so fallacious by reason of the resistance of the air (to which inequality the first is also liable), that the velocities thus assigned may not be perhaps the 10th part of the actual velocities sought.

"To remedy then these inconveniences I have invented a new method of finding the real velocities of bullets of all kinds; and this to such a degree of exactness (which may be augmented too at pleasure), that in a bullet moving with the velocity of 1700 feet in 1", the error in the estimation of it need never amount to its 500th part; and this without any extraordinary nicety in the construction of the machine."

Mr. Robins then gives an account of the machine by which he measures the velocities of the balls, which machine is simply this, viz. a pendulous block of wood suspended freely by a horizontal axis, against which block are to be fired the balls whose velocities are to be determined.

"This instrument thus fitted, if the weight of the pendulum be known, and likewise the respective distances of its centre of gravity and of its centre of oscillation from its axis of suspension, it will thence be known what motion will be communicated to this pendulum by the percussion of a body of a known weight moving with a known degree of celerity, and striking it in a given point; that is, if the pendulum be supposed at rest before the percussion, it will be known what vibration it ought to make in consequence of such a determined blow; and on the contrary, if the pendulum, being at rest, is struck by a body of a known weight, and the vibration which the pendulum makes afte the blow is known, the velocity of the striking body may from thence be determined.

"Hence then, if a bullet of a known weight strikes the pendulum, and the vibration which the pendulum makes in consequence of the stroke be ascertained, the velocity with which the ball moved is thence to be known."

Mr. Robins then explains his method of computing velocities from experiments with this machine; which method is rather troublesome and perplexed, as well as the rules of Euler and Antoni, who followed him in this business; but a much plainer rule is given in Hutton's Tracts, vol. i. p. 119, where such experiments are explained at full length, and this rule is expressed by either of the two following formulas,

$$v = 5{\cdot}6727cg \times \frac{p+b}{bir}\sqrt{o} = 614{\cdot}58cg \times \frac{p+b}{birn},$$

the velocity; where v denotes the velocity of the ball when it strikes the pendulum, p the weight of the pendulum, b the weight of the ball, c the chord of the arc described by the vibration to the radius, r, g the distance below the axis of motion to the centre of gravity, o the distance to the centre of oscillation, i the distance to the point of impact, and n the number of oscillations the pendulum will perform in one minute, when made to oscillate in small arcs. The latter of these two theorems is much the easiest, both because it is free of radicals and because the value of the radical $\sqrt{o}$, in the former, is to be first computed from the number n or number of oscillations the pendulum is observed to make.

With such machines Mr. Robins made a great number of experiments with musket barrels of different lengths, with balls of various weights and with different charges or quantities of powder. He has set down the results of 61 of these experiments, which nearly agree with the corresponding velocities as computed by his theory of the force of powder, and which therefore establish that theory on a sure foundation.

From these experiments, as well as from the preceding theory, many important conclusions

were deduced by Mr. Robins; and indeed by means of these it is obvious that every thing may be determined relative both to the true theory of projectiles, and to the practice of artillery: for, by firing a piece of ordnance charged in a similar manner against such a ballistic pendulum from different distances, the velocity lost by passing through such spaces of air will be found, and consequently the resistance of the air, the only circumstance that was wanting to complete the theory of gunnery or military projectiles; and of this kind Dr. Hutton has made a great number of experiments with cannon balls, and has thereby obtained the whole series of resistances to such a ball when moving with every degree of velocity from 0 up to 2000 feet per second of time. In the structure of artillery they may likewise be of the greatest use: for hence may be determined the best lengths of guns; the proportions of the shot and powder to the several lengths; the thickness of a piece, so as it may be able to confine, without bursting, any given charge of powder; as also the effect of wads, chambers, placing of the vent, ramming the powder, &c. For the many other curious circumstances relating to this subject, and the various other improvements in the theory and practice of gunnery made by Mr. Robins, consult the first vol. of his Tracts collected and published by Dr. Wilson in the year 1761, where ample information may be found.

Soon after the first publication of Robins's New Principles of Gunnery in 1742, the learned in several other nations, treading in his steps, repeated and further extended the same subject, sometimes varying and enlarging the machinery; particularly Euler in Germany, D'Antoni in Italy, and Messrs. D'Arcy and Le Roy in France. But most of these, like Mr. Robins, with small firearms, such as muskets and fusils.

"But (says Dr. Hutton, in his Phil. Dict. p. 556) in the year 1755, in conjunction with several able officers of the Royal Artillery and other ingenious gentlemen, I undertook a course of experiments with the ballistic pendulum, in which we ventured to extend the machinery to cannon shot of 1, 2, and 3 pounds weight. An account of these experiments was published in the Philos. Trans. for 1778, and for which the Royal Society honoured me with the prize of the gold medal. These were the only experiments that I know of which had been made with cannon balls for this purpose, although the conclusions to be deduced from such are of the greatest importance to those parts of natural philosophy which are dependent on the effects of fired gunpowder; nor do I know of any other practical method of ascertaining the initial velocities within any tolerable degree of truth. The knowledge of this velocity is of the utmost consequence in gunnery; by means of it, together with the law of the resistance of the medium, every thing is determinable relative to that business; for, besides its being an excellent method of trying the strength of different sorts of powder, it gives us the law relative to the different quantities of powder, to the different weights of shot, and to the different lengths and sizes of guns. Besides these, there does not seem to be any thing wanting to answer any inquiry that can be made concerning the flight and ranges of shots except the effects arising from the resistance of the medium. In these experiments the weights of the pendulums employed were from 300 to near 600 pounds. In that paper is described the method of constructing the machines, of finding the centres of gravity and oscillation of the pendulum, and of making the experiments, which are all set down in the form of a journal, with all the minute and concomitant circumstances; also the investigation of the new and easy rule set down just above, for computing the velocity of the ball from the experiments. The charges of powder were varied from 2 to 8 ounces, and the shot from 1 to near 3 pounds. And from the whole were clearly deduced these principal inferences, viz.

"First, That gunpowder fires almost instantaneously. 2. That the velocities communicated to balls or shot of the same weight, by different quantities of powder, are nearly in the subduplicate ratio of those quantities: a small variation, in defect, taking place when the quantities of powder became great. 3. And when shot of different weights are employed, with the same quantity of powder, the velocities communicated to them are nearly in the reciprocal subduplicate ratio of their weights. 4. So that, universally, shot which are of different weights, and impelled by the firing of different quantities of powder, acquire velocities which are directly as the square roots of the quantities of powder, and inversely as the square roots of the weights of the shot, nearly. 5. It would therefore be a great improvement in artillery to make use of shot of a long form or of heavier matter; for thus the momentum of a shot, when fired with the same weight of powder, would be increased in the ratio of the square root of the weight of the shot. 6. It would also be an improvement to diminish the windage; for by so doing, one-third or more of the quantity of powder might be saved. 7. When the improvements mentioned in the last two articles are considered as both taking place, it is evident that about half the quantity of powder might be saved, which is a very considerable object. But important as this saving may be, it seems to be still exceeded by that of the article of the guns; for thus a small gun may be made to have the effect and execution of another of two or three times its size in the present mode, by discharging a shot of two or three times the weight of its natural ball or round shot. And thus a small ship might discharge a shot as heavy as those of the greatest now made use of.

"Finally, as the above experiments exhibit the regulations with regard to the weights of powder and balls when fired from the same piece of ordnance, &c. so by making similar experiments with a gun, varied in its length by cutting off from it a certain part before each course of experiments, the effects and general rules for the different lengths of guns may be certainly determined by them. In short, the principles on which these experiments were made are so fruitful in consequences, that, in conjunction with the effects resulting from the resistance of the medium, they seem to be sufficient for answering all the enquiries of the speculative philosopher, as well as those of the practical artillerist."

In the year 1786 was published the first volume of Dr. Hutton's Tracts, in which is detailed, at great length, another very extensive course of experiments which were carried on at Woolwich in the years 1783, 1784, and 1785, by order of the Duke of Richmond, master general of the ordnance. The objects of this course were very numerous, but the principal of them were the following:

"1. The velocities with which balls are projected by equal charges of powder, from pieces of the same weight and calibre, but of different lengths.

"2. The velocities with different charges of powder, the weight and length of the gun being the same.

"3. The greatest velocity due to the different lengths of guns, to be obtained by increasing the charge as far as the resistance of the piece is capable of sustaining.

"4. The effect of varying the weight of the piece; every thing else being the same.

"5. The penetration of balls into blocks of wood.

"6. The ranges and times of flight of balls; to compare them with their initial velocities for determining the resistance of the medium.

"7. The effect of wads;
of different degrees of ramming;
of different degrees of windage;
of different positions of the vent;
of chambers, and trunnions, and every other circumstance necessary to be known for the improvement of artillery."

All these objects were obtained in a very perfect and accurate manner; excepting only the article of ranges, which were not quite so regular and uniform as might be wished. The balls too were most of them of one pound weight; but the powder was increased from 1 ounce up till the bore was quite full; and the pendulum was from 600 to 800lb. weight. The conclusions from the whole were as follow:

"1. That the former law, between the charge and velocity of ball, is again confirmed, viz. that the velocity is directly as the square root of the weight of powder, as far as to about the charge of 8 ounces: and so it would continue for all charges, were the guns of an indefinite length. But as the length of the charge is increased, and bears a more considerable proportion to the length of the bore, the velocity falls the more short of that proportion.

"2. That the velocity of the ball increases with the charge to a certain point, which is peculiar to each gun, where it is greatest; and that by farther increasing the charge, the velocity gradually diminishes till the bore is quite full of powder. That this charge for the greatest velocity is greater as the gun is longer, but not greater however in so high a proportion as the length of the gun is; so that the part of the bore filled with powder bears a less proportion to the whole in the long guns, than it does in the short ones; the part of the whole which is filled being indeed nearly in the reciprocal subduplicate ratio of the length of the empty part. And the other circumstances are as in this table.

TABLE *of Charges producing the greatest Velocity.*

Gun. Num.	Length of the bore.	Length filled.	Part of the whole.	Weight of the powder.
	inches.	inches.		oz.
1	28·2	8·2	$\frac{1}{10}$	12
2	38·1	9·5	$\frac{1}{12}$	14
3	57·4	10·7	$\frac{1}{16}$	16
4	79·9	12·1	$\frac{1}{20}$	18

"3. It appears that the velocity continually increases as the gun is longer, though the increase in velocity is but very small in respect of the increase in length, the velocities being in a ratio somewhat less than that of the square roots of the length of the bore, but somewhat greater than that of the cube roots of the length, and is indeed nearly in the middle ratio between the two.

"4. The range increases in a much less ratio than the velocity, and indeed is nearly as the square root of the velocity, the gun and elevation being the same. And when this is compared with the property of the velocity and length of gun in the foregoing paragraph, we perceive that very little is gained in the range by a great increase in the length of the gun, the charge being the same. And indeed the range is nearly as the 5th root of the length of the bore, which is so small an increase as to amount only to about $\frac{1}{7}$th part more range for a double length of gun.

"5. It also appears that the time of the ball's flight is nearly as the range; the gun and elevation being the same.

"6. It appears that there is no sensible difference caused in the velocity or range, by varying the weight of the gun, nor by the use of wads, nor by different degrees of ramming, nor by firing the charge of powder in different parts of it.

"7. But a great difference in the velocity arises from a small degree of windage. Indeed with the usual established windage only, namely, about $\frac{1}{20}$th of the calibre, no less than between $\frac{1}{3}$ and $\frac{1}{4}$ of the power escapes and is lost. And as the balls are often smaller than that size, it frequently happens that half the powder is lost by unnecessary windage.

"8. It appears that the resisting force of wood to balls fired into it is not constant. And that the depths penetrated by different velocities or charges are nearly as the logarithms of the charges; instead of being as the charges themselves, or which is the same thing, as the square of the velocity.

"9. These, and most other experiments, show that balls are greatly deflected from the direction they are projected in; and that so much as 300 or 400 yards in a range of a mile, or almost $\frac{1}{4}$th of the range, which is nearly a deflection of an angle of 15 degrees.

"10. Finally, these experiments furnish us with the following concomitant data, to a tolerable degree of accuracy, namely the dimensions and elevation of the gun, the weight and dimensions of the powder and shot, with the range and time of flight, and the first velocity of the ball. From which it is to be hoped, that the measure of the resistance of the air to projectiles may be determined, and thereby lay the foundation for a true and practical system of gunnery, which may be as well useful in service as in theory."

"Since the publication of those Tracts (says Dr. Hutton), we have prosecuted the experiments still farther from year to year, gradually extending our aim to more objects, and enlarging the guns and machinery, till we have arrived at experiments with the 6 pounder guns, and pendulums of 1800 pounds weight. One of the new objects of enquiry was the resistance the atmosphere makes to military projectiles; to obtain which, the guns have been placed at many different distances from the pendulum, against which they are fired, to get the velocity lost in passing through those spaces of air; by which and the use of the whirling machine, described near the end of the

1st. vol. of Robins's Tracts, for the slower motions, I have investigated the resistance of the air to given balls moving with all degrees of velocity from 0 up to 2000 feet per second; as well as the resistance for many degrees of velocity to planes and figures of other shapes, and inclined to their path in all varieties of angles; from which I have deduced general laws and formulas for all such motions.

"Mr. Robins made also similar experiments on the resistance of the air, but being only with musket bullets, on account of their smallness and of their change of figure by the explosion of the powder, I find they are very inaccurate, and considerably different from those above mentioned, which were accurately made with pretty considerable cannon balls of iron. For this reason we may omit here the rules and theory deduced from them by Mr. Robins, till others more correct shall have been established. All these experiments indeed agree in evincing the very enormous resistance the air makes to the swift motions of military projectiles, amounting in some cases to 20 or 30 times the weight of the ball itself; on which account the common rules for projectiles deduced from the parabolic theory, are of little or no use in real practice; for from these experiments, it is clearly proved that the track described by the flight even of the heaviest shot is neither a parabola, nor yet approaching any thing near it, except when they are projected with very small velocities; insomuch that some balls, which in the air range only to the distance of one mile, would, *in vacuo*, when projected with the same velocity, range above 10 or 20 times as far." For the common rules of the parabolic theory, see PROJECTILES; and for a small specimen of experiments on resistances, see the 2d vol. of the Edinburgh Philos. Trans.; as also Hutton's Conic Sections and Select Exercises.

Mr. Benjamin Thompson (now count Rumford) instituted a very considerable course of experiments of the same kind as those of Mr. Robins, with musket barrels, which was published in the Philos. Trans. vol. 71, for the year 1781. In these experiments the conclusions of Mr. Robins are generally confirmed, and several other curious circumstances in this business are remarked by Mr. Thompson. This gentleman also pursues a hint thrown out by Mr. Robins, relative to the determination of the velocity of a ball from the recoil of the

[illegible] communicated to the gun by the ball alone, being equal to the momentum of the ball, this becomes known; and therefore being divided by the known weight of the ball, the quotient will be its velocity. Mr. Thompson sets a great value on this new rule, the velocities by means of which he found to agree nearly with several of those deduced from the motion of the pendulum; and in the other cases in which they differed greatly from these, he very inconsistently supposes that these latter ones are erroneous. In the experiments however contained in Dr. Hutton's Tracts, a great multitude of those cases are compared together, and the inaccuracy of that new rule is fully proved.

Having in the 9th prop. compared together a number of computed and experimented velocities of balls to verify his theory; Mr. Robins, in the 10th prop. assigns the changes in the force of powder, which arise from the different state of the atmosphere, as to heat and moisture, both which he finds have some effect on it, but especially the latter. In prop. 11. he investigates the velocity which the flame of gunpowder acquires by expanding itself, supposing it fired in a given piece of artillery, without either a bullet or any other body before it. This velocity he finds is upwards of 7000 feet per second. But the celebrated Euler, in his commentary on this part of Mr. Robins's book, thinks it may be still much greater, and in this prop. too it is that Mr. Robins declares his opinion above alluded to, viz. that the effect of the powder upon the recoil of the gun is the same in all cases, whether fired with a ball or without one. In prop. 12. he ascertains the manner in which the flame of powder impels a ball which is laid at a considerable distance from the charge; showing here that the sudden accumulation and density of the fluid against the ball is the reason that the barrel is so often burst in those cases. In prop. 13. he enumerates the various kinds of powder, and describes the properest methods of examining its goodness. He here shews that the best proportion of the ingredients is when the saltpetre is $\frac{3}{4}$ of the whole compound mass of the powder, and the sulphur and charcoal the other $\frac{1}{4}$ between them, in equal quantities. In this prop. Mr. Robins takes occasion to remark upon the use of eprouvettes, or methods of trying powder; condemning the practice of the English in using what is called the vertical eprouvette; as well as that of the French, in using a small mortar with a very large ball, and a small charge of powder, and instead of these he strongly recommends the use of his ballistic pendulum, for its great accuracy. But for still more dispatch, he says he should use another method, which however he reserves to himself without giving any particular description of it.

The other or 2d chapter of Mr. Robins's work, in 8 propositions, treats "of the resistance of the air, and of the track described by the flight of shot and shells." And of these prop. 1. describes the general principles of the resistance of fluids to solid bodies moving in them. Here Mr. Robins discriminates between continued and compressed fluids, which immediately rush into the space quitted by a body in them, and whose parts yield to the

which conducts [illegible] as this moves quicker, and also presses the less behind it, by following it always with only a given velocity: hence it happens, that the former fluid will resist moving bodies in proportion to the square of the velocity, while the latter resists in a higher proportion. Prop. 2. is "to determine the resistance of the air to projectiles by experiments." One of the methods for this purpose is by the ballistic pendulum, placing the gun at different distances from it, by which he finds the velocity lost in passing through certain spaces of air, and

consequently the force of resistance to such velocities as the body moves with in the several parts of its path. And another way was by firing balls with a known given velocity, over a large piece of water, in which the fall and plunge of the ball could be seen, and consequently the space it passed over in a given time. By these means Mr. Robins determined the resistance of the air to several different velocities, all which showed that there was a gradual increase of the resistance, over the law of the square of the velocity, as the body moved quicker. In the remaining propositions of this chapter, he proceeds a little farther in this subject of the resistance of the air; in which he lays down a rule for the proportion of the resistance between two assigned velocities; and he shows, that when a 24 pound ball, fired with its full charge of powder, first issues from the piece, the resistance it meets with from the air is more than 20 times its weight. He farther shows, that "the track described by the flight of shot or shells is neither a parabola, nor nearly a parabola, unless they are projected with small velocities;" and that "bullets in their flight are not only depressed beneath their original direction, by the action of gravity, but are also frequently driven to the right or left of that direction by the action of some other force: and in the 8th or last proposition, he pretends to show that the depths of penetration of balls into firm substances are as the squares of the velocities. But this is a mistake; for neither does it appear that his trials were sufficiently numerous or various, nor were his small leaden balls fit for this purpose; and it has appeared from a number of trials with iron cannon balls, that the penetrations are in a much lower proportion, and that the resisting force of wood is not uniform. See Dr. Hutton's Tracts.

In the following small tracts, added to the principles, in this volume, Mr. Robins prosecutes the subject of the resistance of the air much farther, and lays down rules for computing ranges made in the air. But these must be far from accurate, as they are founded on the two following principles, which are known, from numerous experiments, to be erroneous: viz. 1st, "That till the velocity of the projectile surpasses that of 1100 feet in a second, the resistance may be esteemed to be in the duplicate proportion of the velocity. 2d, That if the velocity be greater than that of 11 or 1200 feet in a second, then the absolute quantity of that resistance in these greater velocities will be near three times as great as it should be by a comparison with the smaller velocities." For, instead of leaping at once from the law of the square of the velocities, and ever after being about three times as much, experiments prove that the increase of the resistance above the law of the square of the velocity takes place at first in the smallest motions, and increases gradually, more and more, to a certain point, but never rises so high as to be three times that quantity, after which it decreases again. To render this evident, Dr. Hutton has inserted the following table of the actual quantities of resistances, which are deduced from accurate experiments, and which shew also the nature of the law of the variations by means of the columns of differences annexed, reserving the detail of the experiments themselves to another occasion. These resistances are, upon a ball of 19·65 inc. diameter, in avoirdupois ounces, and are for all velocities from 0 up to that of 2000 feet per second of time.

The quantity of the resistance of the air to a ball of 1·965 inc. diameter.

Veloc. in feet	Resist. in ounces.	1st Differences.	2d Differences.
0	0·000		
5	0·006		
10	0·025		
15	0·054		
20	0·100		
25	0·155		
30	0·23		
40	0·42		
50	0·67		
100	2¼	8¾	5¾
200	11	14	6
300	25	20	7
400	45	27	8
500	72	35	9
600	107	44	10
700	151	54	12
800	205	66	13
900	271	79	13
1000	350	92	12
1100	442	104	11
1200	546	115	9
1300	661	124	7
1400	785	131	4
1500	916	135	0
1600	1051	135	2
1700	1186	133	5
1800	1319	128	6
1900	·1447	122	
2000	1569		

If the terms of any arithmetical series be squared, the 2d differences will be equal: hence this table proves the truth of the former part of Dr. Hutton's assertion. The additional tracts of Mr. Robins, in the latter part of this volume, which contain many useful and important matters, are numbered and titled as follows, viz. Number 1, "Of the resistance of the air. Number 2, Of the resistance of the air; together with the method of computing the motions of bodies projected in that medium. Number 3, An Account of the experiments relating to the resistance of the air; exhibited at different times before the Royal Society, in the year 1746. Number 4, Of the force of fired gunpowder, together with the computation of the velocities thereby communicated to military projectiles. Number 5, A comparison of the experimental ranges of cannon and mortars, with the theory contained in the preceding papers. Practical maxims relating to the effects and management of artillery, and the flight of shells and shot. A proposal for increasing the strength of the British navy, by changing all the guns, from the 18 pounders downwards, into others of equal weight, but of a greater bore." With several letters, and other papers, "On pointing, or the directing of the cannon to strike distant objects; Of the nature and advantage of rifled barrel pieces," &c.

"I have (continues Dr. Hutton) dwelt thus long on Mr. Robins's New Principles of Gunnery, because it is the first work that can be considered as attempting to establish a practical system of gunnery, and projectiles, on good experiments, on the force of gunpowder, on the resistance of the air, and on the effects of different pieces of artillery. Those experiments are not however sufficiently perfect, both on account of the smallness of the bullets, and for want of good ranges to

form a proper theory upon. I have supplied some of the necessary desiderata for this purpose, viz. the resistance of the air to cannon balls moving with all degrees of velocity, and the velocities communicated by given charges of powder, to different balls, and from different pieces of artillery. But there are still wanting good experiments with different pieces of ordnance, giving the ranges and times of flight, with all varieties of charges, and at all different angles of elevation. A few however of those I have obtained, as in the following small table, which are derived from experiments made with a medium one-pounder gun, the iron ball being nearly 2 inches in diameter:

Powder.	Elev. of gun.	Veloc. of ball.	Range.	Time of flight.
oz.	°	feet	feet	″
2	15	860	4100	9
4	15	1230	5100	12
8	15	1640	6600	14½
12	15	1680	6700	15½
2	45	860	5100	21

The celebrated Mr. Euler added many excellent dissertations on the subject of gunnery, in his translation of Robins's Gunnery into the German language; which were again farther improved in Brown's translation of the same into English, in the year 1777. See also Antoni's Examen de la Poudre; the experiments of MM. D'Arcy and Le Roy, in the Memoirs of the Academy in 1751; and D'Arcy's Essai d'une theorie d'artillerie in 1760: Dr. Hutton's Tracts, and paper on the force of fired gunpowder in the Philos. Trans. for 1778; and Thompson's Paper on the same subject in 1781. Dr. Hutton has also in his possession several interesting papers containing descriptions of other courses of experiments, from which are deduced many highly valuable results; these we earnestly hope he will publish in the collection of his original works, now preparing for the press. The consideration of the situation he so long and so honourably filled, of his talents, and of his remarkable perseverance, causes us to be persuaded that he can yet furnish more important information on the subject of gunnery than any philosopher now living.

Of the common or parabolic theory of gunnery, Mr. Simpson gives a very neat and concise treatise in his Select Exercises, and Dr. Gregory another in the 1st volume of his Mechanics. Other authors on this part of the subject are Starrat, Gray, Burrow, Williams, Glenie, &c.

GUNPOWDER. (*poudre à canon*, Fr. *das schiesspulver*, Germ.) A mechanical mixture of nitre, charcoal, and sulphur, for the purpose of communicating to guns of every calibre a prodigious projectile power.

The first person who appears to have been acquainted with the nature and effects of a combination of these three materials in a certain proportion to each other, was Roger Bacon. In his treatise De Secretis Operibus artis et Naturæ et de Nullitate Magiæ, cap. 6, published at Oxford, probably in 1216, he tells us, that from salt-petre and other ingredients "we are able to make a fire that shall burn at what distance we please:" and from some manuscript writings of the same philosopher, and a well known anagram under which the secret was enveloped, we have pretty tolerable proof that "these other ingredients" were charcoal and sulphur.

The mode of manufacturing gunpowder does not essentially vary in any country; though there is some difference in the relative proportion of the ingredients employed. In the time of Taraglia, cannon powder was made of four parts of nitre, one of sulphur, one of charcoal: and the musket powder of forty-eight parts of nitre, seven of sulphur, and eight of charcoal. The proportions and method employed at the present day in our own country cannot be better described than from the account given by Mr. Coleman, of the royal powder mills of Waltham Abbey. Gunpowder, according to this gentleman (see Philos. Mag. vol. ix.) should consist of seventy-five parts of nitre or saltpetre, fifteen of charcoal, and ten of sulphur. The saltpetre made use of is chiefly that brought in a rough state from the East Indies, and refined by solution, evaporation, and crystallization; by which means the deliquescent salts, so frequently combined with it, are gotten rid of; and it will keep without growing damp. The sulphur used is imported from Sicily and Italy, where it is collected in its native state in abundance. It is refined by melting and skimming; and when very impure, by sublimation. The sulphur obtained from some of our own copper mines in abundance is too impure for this purpose, as its refinement cannot be conducted without a very heavy and unnecessary expence. The charcoal, in order to ensure its being of an uniformly good quality, has of late years been obtained by inclosing the wood, cut into billets, about nine inches long, in iron cylinders placed horizontally, and burning them gradually to a red heat, the fire being continued till every thing volatile is driven off, and the wood is completely charred. The pyroligneous acid hereby eliminated is collected by pipes, passing out of the iron cylinder, and dipping into casks where the liquor condenses. The acid is employed as a mordant in calico-printing, especially in fixing colours obtained from iron. It is of no consequence what wood is employed, but only that it be thoroughly charred; alder, willow, and dog-wood, are the sorts commonly made choice of.

The above ingredients being duly prepared, they are first separately ground to a fine powder, then mixed in the proper proportions; after which the mixture is fit for the important operation of thoroughly incorporating the component parts in the mill; upon a close attention to which the elastic force of the powder chiefly depends.

A powder-mill is a slight wooden building with a boarded roof, so that in the event of any moderate explosion the roof may fly off without difficulty, and the sudden expansion may take place in the least mischievous direction. Stamping mills were formerly used, consisting of a large wooden mortar, with a very ponderous wooden pestle, commonly made of lignum vitæ, and worked, according to its size, by the power of men or of horses. This method is still continued at the fine powder mills at Battle in Sussex; where, however, only a few pounds of the materials are worked at a time. The only objection to stamping mills is the great danger of their taking fire; and on this account, in most large manufactories, the process of incorporation is performed by two stones placed vertically, and running on a bed-stone or trough. On this trough the ingredients are placed in quantities not exceeding forty or fifty pounds at a time, and

worked for about seven or eight hours, with just so much water as will bring the mass in the grinding to a consistence considerably stiffer than that of paste; in which state it is found by experience that the incorporation of the ingredients proceeds with most ease and accuracy. These mills are worked either by water or with horses.

When taken from the mills, the composition is sent to the corning-house, to be corned or grained: a process which gives to gunpowder, not indeed additional strength, but great facility of keeping dry, and of convenience in the use of it than if in fine dust. Here the stiff paste is first pressed into hard lumps, which are put into circular sieves with parchment bottoms, perforated with holes of different sizes, and fixed in a frame connected with a horizontal wheel. Each of these sieves is also furnished with a runner, or oblate spheroid of lignum vitæ, which being set in motion by the action of the wheel, squeezes the paste through the holes of the parchment bottom, forming grains of different sizes. The grains are then sorted and separated from the dust by sieves of progressive dimensions in their apertures. After this they are glazed or hardened, and the rough edges taken off, by being put into casks filled about half full, and fixed to the axis of a water-wheel; by which means the grains are shaken against each other in rapid revolution, become rounded, and receive a slight gloss or glazing. This process of glazing is found to lessen the force of the powder from a fifth to a fourth, but the powder keeps hereby much better, and is less liable to grow damp.

Being thus corned, glazed, and separated from dust, the powder is next sent to the stove-house to be dried; a part of the general process which requires very great precaution in order to avoid explosion, which in this state would be much more dangerous than before a close incorporation of the ingredients. The stove-house is a square apartment, three sides of which are furnished with shelves or cases on proper supports arranged round the room; and the fourth contains a large cast-iron vessel, called a gloom, which projects into the room, and is strongly heated from the outside, so that it is impossible that any of the fuel can come into contact with the powder. For greater security against sparks by accidental friction, the glooms are covered with sheet copper, and are always cool when the powder is put in or taken out of the room. Here the grains are thoroughly dried, losing in the process all that remains of the water by which the composition had been previously brought into a working stiffness. Mr. Coleman calculates this to be from three to five parts in a hundred of the compound material. The powder thus dried is complete.

The specific gravity of gunpowder is estimated by count Rumford to be about 1.868.

The strength and goodness of powder is judged of in the following ways. By the colour and feel; by the flame when a small pinch is fired; by measuring the actual projectile force by the *eprouvette;* and by the distance to which a given weight will project a ball of given dimensions under circumstances in all cases exactly similar.

When powder, rubbed between the fingers, easily breaks down into an impalpable dust, it is a mark of containing too much charcoal; and the same if it readily soil white paper when gently drawn over it. The colour should not be absolutely black, but of a dark blue, with a little cast of red. The trial by firing is thus managed. Lay two or three small heaps of about a dram each on clean writing paper, about three or four inches asunder, and fire one of them by a red-hot iron-wire: if the flame ascends quickly with a good report, sending up a ring of white smoke; leaving the paper free from white specks and not burnt into holes; and if no sparks fly off from it, setting fire to the contiguous heaps, the powder is judged to be very good, but if otherwise, either the ingredients are badly mixed or impure.

The common eprouvettes, or powder triers, are small strong barrels, in which a determinate quantity of the powder is fired, and the force of expansion measured by the action excited on a strong spring or a great weight.

Another method often adopted, is to fire a very heavy ball from a short mortar with a given weight of the powder, and to find the range of projection. The French eprouvette for government powder is a mortar of seven inches (French) in calibre, which with three ounces of powder, should throw a copper globe of sixty pounds weight to the distance of 300 feet. No powder is admitted which does not answer this trial.

Both these methods have been objected to: the former because the spring is moved by the instantaneous stroke of the flame and not by its continued pressure, which is somewhat different; and the other on account of the tediousness attending its use, when a large number of barrels of powder are to be tried. Another method which unites accuracy with dispatch, is to suspend a small cannon as a pendulum, to fire it with powder only, and to judge of the force of explosion by that of the recoil, which in this circumstance is a greater or less arc of a circle. That which Dr. Hutton employs on this principle is a small cannon about one inch in the bore, the charge of which is two ounces of powder.

The cause and measure of the explosive force of fired gunpowder has been much investigated. It is generally allowed to be chiefly owing to the sudden generation of a quantity of gass or elastic vapour, the chemical constitution of which will be presently mentioned.

To determine the elasticity and quantity of this elastic vapour, produced from a given quantity of powder, Mr. Robins premises that its elasticity is equally increased by heat, and diminished by cold, as that of common air (which is confirmed by Mr. Dalton's late experiments): and consequently its weight is the same with the weight of unequal bulk of air at the same elasticity and temperature. Hence, and from direct experiments, he concludes that the elastic fluid produced by the firing of gunpowder is nearly three-tenths of the weight of the powder itself, which expanded to the rarity of common air, is about 244 times the bulk of the powder. Hence it would follow, that the mere conversion of confined powder into elastic vapour, would exert against the sides of the containing vessel an expansive force 244 times greater than the elasticity of common air, or in other words, than the pressure of the atmosphere. But to this is to be superadded all the increase of expansive power produced by the heat generated, which is certainly very intense, though its exact degree cannot be ascertained. Supposing it to be equal to the full heat of red hot iron, this would increase the expansion of common air (and also of all gasses) about four times, which in the present instance would increase the 244 to nearly 1000; so that in a general way it may be assumed that the

expansive force of closely confined powder at the instant of firing is 1000 times greater than the pressure of common air: and as this latter is known to press with the weight of fourteen pounds and a quarter on every square inch, the force of explosion of gunpowder is 1000 times this, or 14750 pounds, or about six tons and a half on every square inch. This enormous force, however, diminishes in proportion as the elastic fluid dilates, being only half the strength when it occupies a double space, one-third of the strength when in a triple space, and so on.

Mr. Robins found that the strength of powder is the same in all variations of the density of the atmosphere, but not so in every state of moisture, being much impaired by a damp air, or with powder damped with careless keeping, or any other cause; so that the same powder which will discharge a bullet at the rate of 1700 feet in a second in dry air, will only propel it about 1200 feet when the air is fully moist; and a similar difference holds between dry and moist powder.

A very considerable variation is found in the proportions of the ingredients of the powder of different nations and different manufactories; nor, is it exactly ascertained whether there is any one proportion which ought always to be adhered to, and for every purpose. The government powder made in this country is the same for cannon as for small arms, the difference being only in the size of the grain; but in France it appears that there were formerly six different sorts manufactured; namely, the strong and the weak cannon powder, the strong and the weak musquet powder, and the strong and the weak pistol powder. The following are the proportions in each, though the reason of this nicety of distinction is not very obvious. For the strong cannon powder, the nitre, sulphur, and charcoal, were in the proportions of 100 of the first, 25 of the second, and 25 of the third: for the weak cannon powder, 100, 20, and 24; for the strong musquet powder, 100, 18, and 20; for the weak, 100, 15, and 18: for the strong pistol powder, 100, 12, and 15; for the weak, 100, 10, and 18.

The Chinese powder appears, by the analysis of Mr. Napier, to be nearly in the proportions of 100 of nitre, 18 of charcoal, and 11 of sulphur. This powder, which was procured from Canton, was large grained, not very strong but hard, well coloured, and in very good preservation. The sulphur is not (properly speaking) a necessary ingredient in gunpowder, since nitre and charcoal alone well mixed will explode; but the use of the sulphur seems to be to diffuse the fire instantaneously through the whole mass of powder. But if the following experiments are correct, it should seem that the advantage gained by using sulphur in increasing the force of explosion, only applies to small charges; but in quantities of a few ounces, the explosive, or at least the projecting force of powder without sulphur, is full as great as with sulphur.

The following are a few out of many trials made at the royal manufactory at Essone, near Paris, in 1756, to determine the best proportions of all the ingredients. Of powder made with nitre and charcoal alone, 16 of nitre, and 4 of charcoal, was the strongest, and gave a power of 9 in the eprouvette. With all three ingredients, 16 of nitre, 4 of charcoal, and 1 of sulphur, raised the eprouvette to 15; and both a less and a greater quantity of sulphur produced a smaller effect. Then diminishing the charcoal, a powder of 16 of nitre, 3 o charcoal, and 1 of sulphur gave a power of 17 in the eprouvette, which was the highest produced by any mixture. This last was also tried in the mortar eprouvette against the common proof powder, and was found to maintain a small superiority. The powder made without sulphur in the proportions above indicated was also tried in the mortar eprouvette, and with the following singular result. When the charge was only two ounces, it projected a sixty pound copper ball 213 feet, and the strongest powder with sulphur projected it 249 feet; but in a charge of three ounces, the former projected the ball 475 feet, and the latter only 472 feet: and on the other hand, the great inferiority of force in the smaller eprouvette of the powder without sulphur, has been just noticed.

Gunpowder is reckoned to explode at about 600° Fahrenheit; but if heated to a degree just below that of faint redness, the sulphur will mostly burn off, leaving the nitre and charcoal unaltered. The gasses produced by the explosion of powder, have not been analyzed with accuracy since the discovery of all the varieties of gasses with the basis of carbon; but they are certainly carbonic acid, sulphureous acid gass, and carburetted hydrogen. The residue is chiefly a sulphuret of potash, formed by a part of the sulphur uniting with some of the alkali of the nitre; and hence the hepatic smell of a foul and damp gun barrel.

The analysis of gunpowder, performed with sufficient accuracy for most practical purposes, is very easy and simple; but an absolutely accurate analysis is more difficult. The usual way is first to boil the powder with three or four times its weight of water, edulcorating it with more hot water till no saline taste remains. This extracts the nitre only, the quantity of which may be either ascertained by drying the residue, and estimating as nitre all the loss of weight, or more directly by evaporating the watery solution. If the residue, consisting of the sulphur and charcoal, is now spread on an earthen plate of any kind and slowly heated, the sulphur takes fire and burns off gradually, whilst the charcoal remains untouched, when the heat is kept down sufficiently. Beaume found, however, that when all the sulphur is expelled which will be driven off in this heat, a certain portion will still remain, and will not burn away at a lower temperature than will consume the charcoal; so that to the last the burning residue will smell strongly sulphureous. This retained portion of sulphur, he finds by the results of many other experiments, to be very uniformly about one twenty-fourth part of the whole sulphur employed; whence for all common purposes an adequate correction may be made, by estimating that the slow weak combustion of the residue, after the nitre has been got out, destroys only $\frac{23}{24}$ of the sulphur instead of the whole. On trying to separate them by an alkaline solution, he found some of the sulphur to remain undissolved, and still adhering to the charcoal. The way to insure perfect accuracy in analysis, would be first to separate the nitre by hot water, then to acidify all the sulphur by the nitric acid, to dissolve and to precipitate it by a solution of nitrat or muriat of barytes; and from the known constituents of this salt, to find the quantity of sulphur, whilst the charcoal here remains perfectly untouched.

Besides the NITRIC ACID, there are various other acids, as the OXYMURIATIC, the HYPEROXYMURIATIC, the ARSENIC, TUNGSTIC, MOLYB-

DIC, and COLUMBIC, that are powerful supporters of combustion. Of these the most easy of access is the oxymuriatic; and this has in consequence been tried either instead of, or in conjunction with, the nitric acid, to ascertain whether it be possessed of more power. The effect is found to be very singular in the form of oxymuriat of potash, the only form under which it has been tried; it acts with considerably more energy so far as its range extends; but this range is far short of that produced by saltpetre or nitrat of potash: it produces also a much more violent explosion. It has been denominated FULMINATING POWDER; and we have already treated of it under this name.

GUNSHOT-WOUNDS. See SURGERY.

GUN-SMITH, a maker of small fire-arms, as muskets, fowling-pieces, pistols, &c.

GUN-SMITHERY, the business of a gunsmith, or the art of making fire-arms of the smaller sort, as muskets, fowling-pieces, pistols, &c. The principal part of these instruments is the barrel, which ought to have the following properties. 1. Lightness, that it may incommode the person who carries it as little as possible. 2. Sufficient strength and other properties requisite to prevent its bursting by a discharge. 3. It ought to be constructed in such a manner as not to recoil with violence. And, 4. it ought to be of sufficient length to carry the shot to as great a distance as the force of the power employed is capable of doing. See on this subject our article FOWLING-PIECE.

GU'NSTICK. *s.* (*gun* and *stick.*) The rammer of a gun (*Steuart*).

GU'NSTOCK. *s.* (*gun* and *stock.*) The wood to which the barrel of the gun is fixed.

GU'NSTONE. *s.* (*gun* and *stone.*) The shot of cannon (*Shakspeare*).

GUNTER (Edmund), an excellent English mathematician and astronomer, was born in Hertfordshire in 1581, and studied at Westminster-school; from whence he removed to Oxford, where he took the degree of master of arts in 1606, and afterwards entered into holy orders. In 1615 he took the degree of bachelor of divinity: but being peculiarly eminent for his knowledge in the mathematics, he had two years before been chosen professor of astronomy in Gresham-college, London; where he distinguished himself by his lectures and writings. He invented a small portable quadrant; and also the famous line of proportions, which, after the inventor, is called Gunter's scale. He was the first who observed the variation of the magnetic needle. He likewise published Canon Triangulorum; and a work, intitled, Of the Sector, Cross-staff, and other Instruments. This last was published, with an English translation of his Canon Triangulorum, in 4to. by Samuel Foster, professor of Gresham-college. Mr. Gunter died at that college in 1626.

GUNTER'S CHAIN, the chain in common use for measuring land, according to the true or statute measure; so called from Mr. Gunter, its reputed inventor.

The length of the chain is 66 feet, or 22 yards, or four poles of five yards and a half each; and it is divided into 100 links, of 7.92 inches each.

GUNTER'S LINE, a logarithmic line, usually graduated upon scales, sectors, &c.

It is also called the line of lines, and line of numbers; being only the logarithms graduated upon a ruler, which therefore serves to solve problems instrumentally in the same manner as logarithms do arithmetically. It is usually divided into a hundred parts, every tenth of which is numbered, beginning with 1, and ending with 10; so that if the first great division, marked 1, stand for one-tenth of any integer, the next division, marked 2, will stand for two-tenths; 3, three-tenths, and so on; and the intermediate divisions will, in like manner, represent 100th parts of some integer. If each of the great divisions represent 10 integers, then will the lesser divisions stand for integers; and if the great divisions be supposed each 100, the subdivisions will be each 10.

USE OF GUNTER'S LINE.

1. *To find the product of two numbers.*—From 1 extend the compasses to the multiplier; and the same extent, applied the same way from the multiplicand, will reach to the product. Thus if the product of 4 and 8 be required, extend the compasses from 1 to 4, and that extent laid from 8 the same way, will reach to 32, their product. 2. *To divide one number by another.*—The extent from the divisor to unity will reach from the dividend to the quotient: thus to divide 36 by 4, extend the compasses from 4 to 1, and the same extent will reach from 36 to 9, the quotient sought. 3. *To three given numbers, to find a fourth proportional.*—Suppose the numbers 6, 8, 9; extend the compasses from 6 to 8, and this extent, laid from 9 the same way, will reach to 12, the fourth proportional required. 4. *To find a mean proportional between any two given numbers.*—Suppose 8 and 32: extend the compasses from 8 in the left-hand part of the line to 32 in the right; then bisecting this distance, its half will reach from 8 forward, or from 32 backward, to 16, the mean proportional sought. 5. *To extract the square root of any number.*—Suppose 25: bisect the distance between one on the scale and the point representing 25; then the half of this distance, set off from 1, will give the point representing the root 5. In the same manner the cube root, or that of any higher power, may be found by dividing the distance on the line, between 1 and the given number, into as many equal parts as the index of the power expresses; then one of those parts, set from 1, will find the point representing the root required.

GUNTER'S QUADRANT, is a quadrant made of wood, brass, or some other substance; being a kind of stereographic projection on the plane of the equinoctial, the eye being supposed in one of the poles: so that the tropic, ecliptic, and horizon, form the arches of circles, but the hour circles other curves, drawn by means of several altitudes of the sun, for some particular latitude every day in the year.

This instrument is used to find the hour of the day, the sun's azimuth, &c. and other common problems of the sphere or globe; as also to take the altitude of an object in degrees.

GUNTER'S SCALE, usually called by seamen the Gunter, is a large plain scale, having various lines upon it, of great use in working the cases or questions in navigation. This scale is usually two feet long, and about an inch and a half broad, with various lines upon it, both natural and logarithmic, relating to trigonometry, navigation, &c. On the one side are the natural lines, and on the other the artificial or logarithmic ones. The former side is first divided into inches and tenths, and numbered from one to twenty-four inches, running the whole length near one edge. One half the length of this side consists of two plain diagonal scales, for taking off dimensions to three places of figures. On the other half or foot of this side are contained various lines relating to trigonometry, in the natural numbers, and marked thus, viz.

Rumb, the rumbs or points of the compass;
Chord, the line of chords;
Sine, the line of sines;
Tang. the tangents;
S. T. the semi-tangents; and at the other end of this half are,
Leag. leagues, or equal parts;
Rumb, another line of rumbs;
M. L. miles of longitude;
Chor. another line of chords.

Also in the middle of this foot are L, and P, two other lines of equal parts: and all these lines on this side of the scale serve for drawing or laying down the figures to the cases in trigonometry and navigation. On the other side of the scale are the following artificial or logarithmic lines, which serve for working or resolving those cases; viz.

S. R. the sine rumbs;
T. R. the tangent rumbs;
Numb. line of numbers;
Sine, sines;
V. S. the versed sines;
Tang. the tangents;
Meri. Meridion l parts;
E. P. Equal parts.

GUNTOOR, one of the northern circars in the peninsula of Hindustan. The maritime parts of this circar are flat and open, but the interior parts contain some very strong fortresses and posts.

GUNTZBERG, a town of Suabia, in the margravate of Burgaw, with a castle, seated on the Danube. Lat. 48. 35 N. Lon. 10 25 E.

GUN-WALE, or GUNNEL, is the uppermost wale of a ship, or that piece of timber which reaches on either side from the quarter-deck to the forecastle, being the uppermost bend which finishes the upper works of the hull, in that part in which are put the stanchions which support the waste-trees.

GURGE. *s.* (*gurges*, Latin.) Whirlpool; gulf (*Milton*).

GU'RGION. *s.* The coarser part of he meal, sifted from the bran.

To GU'RGLE. *v. n.* (*gorgogliare*, Ital.) To fall or gush with a noise, as water from a bottle (*Pope*).

GURIEF, a town of Russia, in the government of Astracan, seated near the Caspian sea. Lat. 46. 32 N. Lon. 52. 50 E.

GURNARD, in ichthyology. See TRIGLA.

GURRAH, a town of Hindustan Proper, situate near the river Nerbuddah. Lat. 23. 9 N. Lon. 80. 23 E.

GURRAMCONDA, a town of the peninsula of Hindustan, in the kingdom of Mysore. Lat. 13. 47 N. Lon. 78. 36 E.

To GUSH. *v. n.* (*gostelen*, Dutch.) 1. To flow or rush out with violence; not to spring in a small stream, but in a larger body (*Thomson*). 2. To emit in a copious effluxion (*Pope*).

GUSH. *s.* (from the verb.) An emission of liquor in a large quantity at once; the liquor so emitted.

GU'SSET. *s.* (*gousset*, French.) Any piece sewed on cloth, in order to strengthen it.

GUST. *s.* (*goust*, French; *gustus*, Latin.) 1. Sense of tasting (*Pope*). 2. Height of perception (*Milton*). 3. Love; liking (*Tillotson*). 4. Turn of fancy; intellectual taste (*Dryden*). 5. (from *guster*, Islandick.) A sudden violent blast of wind (*Addison*).

GU'STABLE. *a.* (*gusto*, Latin.) 1. To be tasted (*Harvey*). 2. Pleasant to the taste (*Derham*).

GUSTA'TION. *s.* (*gusto*, Latin.) The act of tasting (*Brown*).

GUSTAVIA. In botany, a genus of the class monadelphia, order polyandria. Calyx four or six-cleft; petals four or six; berry dry, four or five-celled. Two species: trees of Guiana and Surinam, from twenty to thirty feet high; the tallest with large, white flowers, the petals tipt with red.

GUSTAVUS ADOLPHUS, surnamed the Great, king of Sweden, was born at Stockholm in 1594, and succeeded his father Charles in 1611. He zealously espoused the cause of the Protestants in Germany, who were sadly oppressed and persecuted by the emperor Ferdinand. He was a great warrior, and his share in the German contests forms one of the most interesting passages in the history of Europe. Many of these are detailed in Coxe's History of the House of Austria. This illustrious protestant hero yielded up the breath of life, just as he grasped the palm of victory, at the battle of Lutzen, being then only in the 38th year of his age. He was, doubtless, one of the greatest monarchs that ever adorned a throne. The following character of him is given by Mr. Coxe in the interesting work before mentioned. "As an individual, he was religious without bigotry or affectation, temperate, and a pattern of conjugal fidelity and domestic affection. Though unable to conquer at all times a constitutional warmth of temper, he possessed all the social virtues, and the conci-

liation of courtesy, in so high a degree, that no individual was ever admitted to his converse without being charmed, or left his presence dissatisfied. To all these amiable qualities, he united the learning of a scholar, and the accomplishments of a gentleman. As a statesman he was firm, sagacious, and provident, embracing equally the grand features and minute details of the most extensive plans. As a general, he surpassed his contemporaries in his knowledge of all the branches of the military art, in a bold, inventive, and fertile genius. This intuitive sagacity, undisturbed presence of mind, and extensive foresight, were warmed and animated by an intrepidity more than heroic. No commander was ever more ready to expose his person to dangers, or more willing to share the fatigues and hardships of his troops: he was accustomed to say, 'Cities are taken by keeping in tents; as scholars, in the absence of the master, shut their books, so my troops, without my presence, would slacken their blows.' Like many other great men he was a predestinarian, from a pious submission to the inevitable decrees of an all-wise Providence: to those who urged him to spare his person, he replied, 'My hour is written in heaven, and cannot be reversed on earth.'

"He created a new system of tactics, and formed an army which was without a parallel for its excellent discipline, and for its singular vigour, precision, and unity in action. He conquered, not by dint of numbers, or the impulse of a fortunate rashness, but by the wisdom and profoundness of his combinations, by his irresistible yet bridled spirit of enterprize, by that confidence and heroism which he infused into his troops. Since the days of Alexander, the progress of no conqueror had been equally rapid; since the time of Cæsar, no individual had united, in so consummate a degree, all the qualities of the gentleman, the statesman, and the soldier."

GU'STFUL. *a.* (*gust* and *full.*) Tasteful; well-tasted (*Decay of Piety*).

GU'STO. *s.* (Italian.) 1. The relish of any thing; the power by which any thing excites sensations in the palate (*Derham*). 2. Intellectual taste; liking (*Dryden*).

GUSTO (Con), in music, with taste.

GUSTROW, a city of Germany, in the duchy of Mecklenburg-Schwerin, and capital of the circle of Winden. Here is an elegant palace, in which the dukes sometimes reside. Lat. 53. 57 N. Lon. 12. 13 E.

GU'STY. *a.* (from *gust.*) Stormy; tempestuous (*Shakspeare*).

GUT. *s.* (*kutteln*, German.) 1. The long pipe reaching, with many convolutions, from the stomach to the vent (*Bacon*). 2. The stomach; the receptacle of food: proverbially (*Hudibras*). 3. Gluttony; love of gormandizing (*Hakewill*).

To GUT. *v. a.* (from the noun.) 1. To eviscerate; to draw; to exenterate. 2. To plunder of contents (*Dryden*).

GUTSKOW, a town of Swedish Pomerania, capital of a county of the same name. Lat. 54. 0 N. Lon. 13. 39 E.

GUTTA, the Latin term for a drop.

GUTTA GAMBA. See GAMBOGIA.

GUTTA SERENA. See AMAUROSIS.

GUTTÆ ROSACEÆ. Red spots upon the face and nose.

GUTTÆ, in architecture, ornaments used in the Doric corniche, or in the architrave underneath the triglyphs, representing six conical drops or bells.

GUTHRIE (William), a native of Scotland, was born in 1701, and educated at Aberdeen. His most esteemed work is his Geographical Grammar. He died in 1769.

GU'TTATED. *a.* (from *gutta*, Latin, a drop.) Besprinkled with drops; bedropped.

GUTTEELLBERG (John), one of those to whom the invention of the art of printing is attributed, was a German, descended of a noble family, and born at Mentz in 1408. If he did not absolutely invent printing, it is probable he was the first who conceived the idea of printing a book; which he executed, first with blocks of wood engraved, and afterwards with separate letters cut in wood. He died at Mentz in 1468.

GU'TTER. *s.* (from *guttur*, a throat; Lat.) 1. A passage for water. 2. A small longitudinal hollow.

To GU'TTER. *v. a.* (from the noun.) To cut in small hollows.

GUTTERS, in building, a kind of canals in the roofs of buildings, serving to drain, receive, and carry off the rain-waters. They are generally lined with sheet-lead. They should always be with a slope sufficient to prevent the water from standing in plashes.

To GU'TTLE. *v. n.* (from *gut.*) To feed luxuriously; to gormandize (*Dryden*).

To GU'TTLE. *v. a.* (from *gut.*) To swallow. A low word (*L'Estrange*).

GU'TTLER. *s.* (from *guttle.*) A greedy eater.

GU'TTULOUS. *a.* (from *guttula*, Latin.) In the form of a small drop (*Brown*).

GU'TTURAL. *a.* (*gutturalis*, Latin.) Pronounced in the throat; belonging to the throat (*Holder*).

GUTTURAL ARTERY. The superior thyroideal artery. The first branch of the external carotid.

GU'TTURALNESS. *s.* (from *guttural.*) The quality of being guttural.

GUTTY, in heraldry, a term used when any thing is charged or sprinkled with drops. In blazoning, the colour of the drops is to be named, as gutty of sable, of gules, &c.

GUY (Thomas), the founder of Guy's Hospital, was the son of Thomas Guy, lighterman and coal-dealer in Horsley-down, Southwark. He was bred a bookseller, and began trade with no larger a stock than 200l.; but the bulk of his fortune was made by purchasing seamen's tickets during queen Anne's wars, and by speculations in South-Sea stock, in the memorable year 1720. Besides Guy's Hospital, he erected

an alms-house at Tamworth. He died in 1724, aged 81, worth 300,000*l*.

GUY, in a ship, is any rope used for keeping off things from bearing or falling against the ship's sides when they are hoisting in. That rope which at one end is made fast to the fore-mast, and seized to a single block at the pendant of the garnet, is called the guy of the garnet.

GUYON (Johanna Mary Bouriers de la Mothe), a French lady, memorable for her writings, and for her sufferings in the cause of Quietism, was descended from a noble family, and born at Montargis in 1648. She shewed some extraordinary symptoms of illumination from her earliest infancy, and tried to take the veil before she was of age to dispose of herself; but her parents obliged her to marry a gentleman to whom they had promised her. She was a widow at the age of 28; when, distinguishing herself in the way of contemplation and prayer known by the name of Quietism, complaints were made of her spiritualism, and she was confined by order of the king, and severely examined for eight months. She was discharged; but was afterwards involved in the persecution of the archbishop of Cambray, and thrown into the Bastile, where she underwent many examinations; but nothing being made out against her, she once more obtained her liberty, and lived private till her death, in 1717. She spent her latter years in mystical reveries; covering her tables, ceilings, and every thing that would receive them, with the traces of a visionary imagination. Her pious verses were collected after her death in 5 vols. intitled Cantiques spirituels, ou d'Emblemes sur l'Amour Divin. Her publications were, Le moyen court et tres facile de faire Oraisons; and Le Cantique des Cantiques de Salomon interpreté selon le sens mystique; which were condemned by the archbishop of Paris. Several of her poems were translated by the late Mr. W. Cowper; since the death of that admirable poet they have been published by the Rev. Mr. Bull of Newport-Pagnel.

GUZES, in heraldry, roundles of a sanguine or murry colour. These, from their bloody hue, are by some supposed to represent wounds.

GUZERAT, a peninsula of Hindustan Proper, 200 miles long, and 140 broad, formed by the Arabian sea, and the gulfs of Cambay and Cutch. Amedabat is the capital.

To GU'ZZLE. *v. n.* (from *gut* or *gust*.) To gormandize; to feed immoderately (*Gay*).

To GU'ZZLE. *v. a.* To swallow with immoderate gust (*Dryden*).

GU'ZZLER. *s.* (from *guzzle*.) A gormandizer; an immoderate eater or drinker (*Dryden*).

GWALIOR, an ancient fortress of Hindustan Proper, in the province of Gohud. It stands on a vast rock, about four miles in length, but narrow and of unequal breadth, and nearly flat on the top. The sides are so steep as to appear almost perpendicular in every part; for where it was not naturally so, it has been scraped away; and the height from the plain below is from 200 to 300 feet. The rampart conforms to the edge of the precipice all around; and the only entrance is by steps running up the side of the rock, defended on the side next the country by a wall and bastions. The area within is full of noble buildings, reservoirs of water, wells, and cultivated land; so that it is a little district within itself. At the N.W. foot of the mountain is the town, pretty large, and well built, the houses all of stone. This place is considered as the Gibraltar of the East; but, in 1780, major Popham took it by an unexpected nocturnal escalade. It is 80 miles S. of Agra. Lat. 26. 9 N. Lon. 78. 30 E.

GWINIAD, in ichthyology. See SALMO.

GYARIUS, in the ancient geography, one of the Cyclades, 12 miles in compass, lying to the east of Delos. It was a desart island, and allotted for a place of banishment by the Romans.

GYBE. *s.* (See GIBE.) A sneer; a taunt; a sarcasm (*Shakspeare*).

To GYBE. *v. n.* To sneer; to taunt (*Spenser*).

GYFHORN, a town of Lower Saxony, in the duchy of Lunenberg, seated on the rivers Aller and Iser. Lat. 52. 49 N. Lon. 10. 49 E.

GYMNANTHES. In botany, a genus of the class monœcia, order monadelphia. Male: ament naked; perianthless; corolless; stamens, pedicels two-parted or three-forked, bearing the anthers. Fem.: ament or germ pedicelled; corrolless; style three-cleft; capsule three-grained, three-celled. Two species: shrubs of Jamaica and Hispaniola.

GYMNASIARCH, in antiquity, the director of the gymnasium. He had two deputies under him; the one called xystarch, who presided over the athletæ, and had the oversight of wrestling; the other was gymnastes, who had the direction of all other exercises.

GYMNASIUM, from γυμνος, *nudus*, because the athletes were usually naked, was a place among the Greeks, where all the public exercises were performed, and where not only wrestlers and dancers exhibited, but also philosophers, poets, and rhetoricians repeated their compositions. The laborious exercises of the gymnasium were running, leaping, throwing the quoit, wrestling, and boxing, which was called by the Greeks πενταθλον, and by the Romans *quinquertia*.

The gymnasia were not single edifices, but a knot of buildings united, being sufficiently capacious to hold many thousands of people at once; and having room enough for philosophers, rhetoricians, and the professors of all other sciences to read their lectures; and wrestlers, dancers, and all others who had a mind to exercise; at the same time without the least disturbance or interruption. They consisted of a great many parts. Vitruvius recites no less than twelve, the chief of which were the Coriceum, the Ephebeum, the Alipterium, the

Palæstra, the Sphæristerium, the Stadium, and the Xysti. See Coriceum, &c.

GYMNASTES. See Gymnasiarch.

GYMNA'STIC. *a.* (γυμναςικος.) Pertaining to athletic exercises (*Arbuthnot*).

GYMNA'STICALLY. *ad.* (from *gymnastic.*) Athletically; fitly for strong exercise (*Brown*).

GYMNASTICON, the name given to a machine invented by Mr. Lowndes, which enables persons to exercise themselves in any degree wished for, in their own chambers, in all parts of the body at once, or partially, as the case may require. For this invention Mr. Lowndes has obtained letters patent; and it appears well calculated to afford suitable degrees of exercise to sick people; in which case, it may be of the highest importance and utility.

GYMNASTICS, Gymnastice, or the Gymnastic art, the art of performing exercises of the body, whether for defence, health, or diversion. See (Gymnasium.) Several modern writers have treated of this art. M. Burette has given the history of gymnastics in the Memoirs of the Royal Academy of Inscriptions. On the first establishment of society, men, being apprised of the necessity of military exercises for repelling the insults of their neighbours, instituted games and proposed prizes to animate their youth to combats of divers kinds. And as running, leaping, strength and dexterity of arm in throwing the javelin, driving a ball, or tossing a quoit, together with wrestling, &c. were exercises supposed to be suited to the manner of fighting in those days, so the youth vied to excel in them, in the presence of the aged, who sat as their judges, and dispensed prizes to the conquerors; till what was originally only amusement became at length a matter of such importance as to interest great cities and entire nations in its practice.

According to Plato, one Herodicus, prior a little time to Hippocrates, was the first who introduced this art into physic; and his successors, convinced by experience of its usefulness, applied themselves in earnest to improve it. Hippocrates, in his book of Regimen, has given instances of it, where he treats of exercise in general, and of the particular effects of walking, with regard to health; also of the different sorts of races, either on foot or horseback; leaping, wrestling, the exercise of the suspended ball, called corycus, chironomy, unctions, frictions, rolling in the sand, &c. But as physicians did not adopt all the exercises of the gymnastic art in their practice, it came to be divided between them and the masters of martial and athletic exercises, who kept schools, the number of which was greatly increased in Greece. The Romans, at length, caught the same taste; and advanced the gymnastics to a great pitch of magnificence. There is no doubt that, under proper regulations, the gymnastic art might considerably improve the human strength and constitution; but in the way it was practised by the ancients it frequently produced deformity. See Athletæ.

Real or supposed improvements in the customs of the European nations have now nearly abolished or altered almost all of the ancient gymnastic exercises; active feats and sudden turns of the body, or tumbling, are totally despised, and confined to the most pitiful public exhibitions; playing with the ball is very little practised; leaping and foot races are limited to a few wagers; pitching the quoit seldom extends beyond the apprentice and the labourer; throwing the javelin is entirely discontinued; wrestling, long a favourite athletic exercise in England, belongs almost exclusively to the wanton school-boy; boxing, (thanks to our morals) to the lowest wretches in society; the tournament, evidently derived from the Ludus Trojæ, is nearly forgotten; the chariot race is in the same state of disuse; and we have nothing which resembles the military pyrhic; and even the faint similarity of the games enumerated are supported by the caprice of a few individuals, who are often condemned for employing their time to so little purpose.

On the other hand, if we turn our attention to the rest of the world, we shall find that many of the gymnastic sports are in full use at this moment, without the inhabitants suspecting that nations very remote from them had similar some thousand years past. Two instances of this fact are so exactly in point, that we cannot refrain from giving them. Mr. Cordiner, who very lately presented the public with a work descriptive of the island of Ceylon, relates the particulars of a Cingalese play, in the following words:

"Gay and noisy amusements do not often interrupt the predominant repose of the genuine Ceylonese; but a sort of comical representation is sometimes attempted, to gratify a man of elevated rank, or to celebrate an occasion of extraordinary festivity. On the 28th of December, 1803, while lord viscount Valentia was visiting governor North at Columbo, a numerous company of the British inhabitants were favoured, after dinner, with the sight of an exhibition, called by the natives a Cyngalese play, although from the rude nature of the performance it can hardly be ranked among the productions of the dramatic art. The stage was the green lawn before his excellency's villa at St. Sebastian, and the open theatre was lighted with lamps supported on posts, and flambeaus held in men's hands. The entertainment commenced with the feats of a set of active tumblers, whose naked bodies were painted all over with white crosses. They walked on their hands, and threw themselves round, over head and heels, three or four times successively, without a pause. Two boys embracing one another, with head opposed to feet, tumbled round like a wheel, but necessarily with a slower motion, as a momentary stop was required when each person touched the ground. The young performers, singly, twisted their bodies with a quickness and flexibility

which it would be difficult to imitate in a less relaxing climate. Some of the movements produced sensations by no means agreeable, as they conveyed the idea of occasioning uneasiness to the actors. After this, six or seven professed dancers appeared on the stage. They were dressed like the gay damsels on the coast of Coromandel; but the greater part of them appeared not to be females, and an inferiority of gesticulation was visible in the style of their performance. Two men, raised upon stilts, walked in amongst them, exhibiting a most gigantic stature; pieces of bamboo were tied round their legs, reaching only a little above the knee, and elevating them three feet from the ground: they moved slowly, without much ease, and had nothing to support them but the equipoise of their own bodies: a man then appeared, masked, armed with a sword and switch, and habited in the old Portuguese dress; two others, resembling Dutchmen, and masked, preceded, who skipped about and drove all before them in an imperative manner; groupes of horrible masks, set with teeth, one of which had the head and proboscis of an elephant, followed; the persons who bore them carried lighted torches in each hand, those they whirled rapidly round, alternately lighting and extinguishing them in the course of their revolutions; these personified devils, and sometimes laughed to excess, but said little; imitations of wild animals next appeared; "but the prettiest part of the entertainment was a circular dance, by twelve children about ten years of age; they danced opposite to one another, two and two, all couretsied at one time down to the ground, shook their whole bodies with their hands fixed in their sides, and kept time to the music with two little clattering sticks, one in each hand. Going swiftly round, being neatly dressed, of one size, and perfect in the performance, this youthful dance produced a very pleasing effect, and brought to remembrance the pictures of the fleeting hours."

Captain Cook relates, in the second volume of the account of his voyage to the Pacific Ocean and the Sandwich Islands, that the natives play at bowls with pieces of whetstone, in shape resembling a small cheese, rounded at the edges, highly polished, and weighing about a pound. "They also use, in the manner that we throw quoits, small, flat, rounded pieces of the writing-slate, of the diameter of the bowls, but scarcely a quarter of an inch thick, also well polished."

GYMNETRUS. In zoology, a genus of the class pisces, order thoracica. Body extremely long, compressed; teeth numerous, subulate; gill-membrane four or five-rayed; anal fin wanting. Four species: inhabitants of European and Asiatic seas. We have made this fish a distinct genus principally on the authority of Dr. Shaw, for it is not so arranged by many respectable ichthyologists: and even Dr. Shaw himself admits that two out of the four species at least are doubtful. (See Nat. Hist. Pl. CXXVIII.) The other two are as follows.

1. G. ascanii. Silvery gymnetrus. Speckled longitudinally with brown points; the ventral cirri dilated at the tips. "This extraordinary fish," observes Dr. Shaw, "seems to have been unknown till within the space of a few years past; nor are its character and history yet so distinctly ascertained as might be wished. It is a native of the northern seas, and seems to have been first described by professor Ascanius in his work, intitled Icones rerum naturalium. The length of the specimen was ten feet, and the diameter, which was equal throughout the whole length, about six inches: the head short, the mouth small, and the eyes rather large: on the upper part of the head, before the commencement of the dorsal fin, were situated seven or eight upright, naked rays, or processes, of moderate length; the dorsal fin, which was rather shallow, commenced at a small distance beyond these; and running along the whole length of the back, formed, by its continuation, the tail fin, which was carried to a very small distance beneath the body, there being, properly speaking, no vent-fin: the pectoral fins were very small, of a slightly ovate, or rounded shape, and situated at a small distance from the head: the ventral fins, if they can be said to deserve the name, consisted of a pair of extremely long single rays or processes terminated by a small ovate expanded tip or finny extremity; the gill-covers appeared to consist of five or six radiated laminæ; the colour of the whole body was bright silver, with a blueish-cast diffused over the upper part of the back; the lateral line was strongly marked, and ran from the gill-covers to the tail, and the sides of the body were marked by several longitudinal double rows of slightly extant, very small, dusky specks; the forehead was white, the fins pale brown. This fish is said to be generally seen either preceding or accompanying the shoals of herrings in the northern seas, for which reason it is popularly known by the title of *King of the Herrings*."

2. G. Blochii. Bluish-silvery with oblique linear, brown bands; rounded spots, red fins; and four ventral rays. A native of the Indian seas; but occasionally met with in the seas of Europe. In its general appearance nearly allied to the preceding species. A specimen of this fish appears to have been found in Feb. 1798, on the coast of Cornwall. Length eight feet six inches; breadth in the widest part ten inches and a half; thickness two inches and three quarters: tailless.

GY'MNIC. *a.* (γυμνικος) Such as practise the athletic or gymnastic exercises (*Milton*).

GYMNOPOGUM. In botany, a genus of the class pentandria, order monogynia. Corol twisted; stigma two-lipped, villous at the tip; drupe with a half, two-celled nut. Three species, natives of the Polynesian isles.

GYMNOSOPHISTS, a sect of philosophers who clothed themselves no farther than modesty required. There were some of these

sages in Africa; but the most celebrated clan of them was in India. The African gymnosophists dwelt upon a mountain in Ethiopia, near the Nile, without the accommodation either of house or cell. They did not form themselves into societies like those of India, but each had his private retirement, where he studied and performed his devotions by himself. If any person had killed another by chance, he applied to these sages for absolution, and submitted to whatever penances they enjoined. They observed an extraordinary frugality, and lived only upon the fruits of the earth. Lucan ascribes to these gymnosophists several new discoveries in astronomy.

The Indian gymnosophists dwelt in the woods, where they lived upon the wild products of the earth, and never drank wine, nor married. Some of them practised physic, and travelled from one place to another: these were particularly famous for their remedies against barrenness. Some of them, likewise, pretended to practise magic, and to foretel future events.

GYMNOSPERMIA. The name of the first order in the class didynamia, in Linnéus's Artificial Arrangement; comprehending those plants which have four stamens, of which the two middle ones are shorter than the two outer ones, within a ringent flower, succeeded by four naked seeds.—These are the same with the labiati of Tournefort; and the verticillatæ of Ray, and of Linnéus in his Natural Orders.—See DIDYNAMIA ANGIOSPERMIA, and BOTANY.

GYMNOSPERMOUS. (γυμνος naked, and σπερμα seed.) In botany, a term applied to a plant bearing naked seeds; in opposition to that which has seeds inclosed in a capsule or other vessel.

GYMNOSTOMUM, in botany, a genus of the class cryptogamia, order musci. Capsule with the mouth naked; lid deciduous; veil entire, separating from the base; flowers terminal. Seventeen species; all but one indigenous to our own country.

GYMNOTHORAX, in zoology, a genus of the class pisces, order apodalia. Body eelshaped; without pectoral fin; spiracle single on each side, small, oval, uncovered; mouth armed with numerous sharp teeth; nostrils tubular. Four species, inhabitants of the American or Mediterranean seas. The largest is G. echidra; with head depressed; body varied with brown and black, and immediately behind the head very turgid: mouth large, with two cirri near the nostrils; eyes vivacious; gape large: flesh very good. Inhabits Palmerston Island: from four to five feet long: from ten to twelve inches thick: has a horrid aspect, and much resembles a serpent.

GYMNOTUS, in zoology, a genus of the class pisces, order apodal. Head with lateral opercules: two tentacles at the upper lip; eyes covered with the common skin: gill-membrane five-rayed; body compressed, carinate beneath with a fin. Nine species, chiefly inhabitants of the South American coasts: one, of the Mediteranean sea. The following are the chief:

1. G. electricus. Electric eel or gymnote. Blackish, without dorsal fin; caudal fin very obtuse and joined to the anal. Head sprinkled with perforated dots; around the body a number of small annular bands or rather wrinkles, by which it has a power of contracting or extending its length: nostrils two on each side; the first large, tubular, and elevated, the others small and level with the skin; teeth small, prickly; tongue broad, and warty, as is also the palate. Inhabits various parts of South America; from three to four feet long; has a remarkable power of inflicting an electrical shock whenever it is touched. This may be conveyed even through a stick to the person who holds it, and is so severe as to benumb the limbs of such as are exposed to it. By this power it stupefies and then seizes such smaller fishes and animals as have ventured to approach it, and thus makes them its prey. This extraordinary power in the electric gymnote was first ascertained by M. Richer, in 1671: but the principle upon which it depends not having been detected, the discovery was at first regarded with a considerable portion of general scepticism. Subsequent experiments, however, and especially those of Condamine and Ingram, and more recently those of Dr. Bancroft, have removed every doubt, and traced this peculiar endowment to its true source. See Nat. Hist. Pl. CXXVIII.

2. G. albifrons. White-shouldered gymnote. Fore-part of the back snowy; head with a deeper mouth than the rest of its tribe; very obtuse, fleshy, and sprinkled with minute pores: upper lip very thick, including the lower; tongueless; gill-covers with a semilunar opening before the fleshy base of the pectoral fins, black prominent, with a small double bone at the base of the first ray: palate beset with papilla: anal fin beginning from the throat: fore-part of the back convex, with a brown, soft, fleshy cirrus behind the middle, posteriorly to which it is destitute of scales: tail compressed, flat, with an oval fin; from the tip of the lower jaw to the middle of the back a snowy band. Inhabits Surinam; about a foot long. It is uncertain whether this or the ensuing possess any electric power: their general character should rather induce us to suppose that they do.

3. G. carapo. American gymnote, naked brown, without dorsal fin: tail tapering to a point; lower jaws shorter: back blackish, spotted with brown; anal fin not reaching to the tip of the tail, but terminating before the caudal. Inhabits the fresh water rivers of America; from one to two feet long: flesh very good. See Nat. Hist. Pl. CXXVIII.

GYMSOPHILA, in botany, a genus of the class decandria, order digynia. Calyx one-leafed, campanulate, angular; petals five, ovate sessile; capsule globular, one-celled. Thirteen species; chiefly plants of the south of Europe; and one of which, G. struthium, from its saponaceous property, is used by the Spa-

nards for the purpose of soap. It is a native of Spain, with linear, fleshy leaves, the axillary ones crowded and round.

GYNÆCEUM, in antiquity, a separate room where the women employ themselves.

GYNÆCIA. (γυναικεια, from γυνη, a woman.) The menstrual discharge. Sometimes the lochia.

GYNÆCOCRACY, the government of women; or a state where they are capable of the supreme command.

GYNÆCOCRATUMENI, an ancient people of Sarmatia Europoea, inhabiting the eastern banks of the river Tanais, near its opening into the Palus Mœotis. They were thus called, because under the dominion of women. They who take the Amazons for a fabulous people, have generally concluded the same of the Gymnæcocratumeni.

GYNÆCOCOSMI. (Γυναικοκοσμοι.) In antiquity, Athenian magistrates, whose business it was to regulate the women's apparel and manners, according to the rules of modesty and decency. Of these magistrates there were ten; and they were sometimes called Gynæconomi.

GYNÆCOMASTOS. (of γυνη, woman, and κομιζω, I bear.) A term used by the ancients, to express a man whose breasts are large and turgid like those of women, and afford milk.

GYN'ANDRIA. (γυνη, a woman, and ανηρ, a man.) In botany, the name of the twentieth class in the Linnéan Artificial System, containing all plants with hermaphrodite flowers, which have the stamens growing upon the style; or else having an elongate receptacle bearing both stamens and styles. This class has been considerably reduced by some modern reformers, and the plants referred to other classes. Others have entirely dismissed it from the sexual system. The reduction appears reasonable; but the singularity of the order diandria surely may demand a separate class for itself. See BOTANY.

GYPSIES, or EGYPTIANS, a strange outlandish tribe of vagabonds, impostors, and jugglers, who disguise themselves in uncouth habits, smearing their faces and bodies, and framing to themselves a canting language, wander up and down, and under pretence of telling fortunes, curing diseases, &c. abuse the common people, trick them of their money, and steal all that they can come at. There are several statutes made against them.

Egyptians coming into England are to depart the realm in fifteen days, or be imprisoned, by 22 Henry VIII. cap. 10. And by 1 and 2 P. and M. cap. 4. any person importing them into this kingdom shall forfeit forty pounds; and if they remain here above one month; or if any person, fourteen years old, consort with them, they are guilty of felony, without benefit of clergy. 5 Eliz. cap. 20. And we are informed by sir M. Hale, that at one Suffolk assizes no less than thirteen gypsies were executed upon these statutes, a few years before the Restoration. See also 39 Eliz. cap. 4. § 2. 17 Geo. II. cap. 5. § 2.

The origin of this tribe is somewhat obscure; at least, the reason of the denomination is so. It is certain, the ancient Egyptians had the character of great cheats, and were famous for the subtilty of their impostures; whence the name might afterwards pass proverbially into other languages, as it is pretty certain it did into the Greek and Latin; or else, the ancient Egyptians, being nuch versed in astronomy, which in those days was little else but astrology, the name was on that score assumed by these tellers of good fortune.

Be this as it will, there is scare any country of Europe but has its Egyptians, though not all of them under that denomination: the Latins call them Ægyptii; the Italians, Cingani and Cingari; the Germans, Zigeuner; the French, Bohemiens; others, Saracens; and others, Tartars, &c.

Munster, Georg. lib. iii cap. 5. relates, that they made their first appearance in Germany, in 1417, exceedingly tawny and sunburnt, and in pitiful array, though they affected quality, and travelled with a train of hunting-dogs after them, like nobles. The above date should probably have been 1517, as Munster himself owns he never saw any till 1524. He adds, that they had passports from king Sigismund of Bohemia, and other princes. Ten years afterwards, they came into France, and thence passed into England.

A very circumstantial account of this singular race of vagrants has been lately given in an express enquiry concerning them, written in German by H. M. G. Grellman, and translated by Mr. Raper. It is incredible to think how this regular swarm of banditti has spread itself over the face of the earth. They wander about in Asia, in the interior parts of Africa, and, like locusts, have overrun most of the European nations. In the reigns of Henry VIII. and queen Elizabeth, they were set up as a mark of general persecution in England; yet their numbers do not appear to have much diminished. Spain is supposed by Mr. Twiss to contain 40,000 of these vagrants; but by others 60,000; and by some even double that number. They became less numerous in France in consequence of the strictness of the police. In Italy they abound, especially in the dominions of the church, on account of the bad police and the prevalence of superstition, which permit and entice them to deceive the ignorant. They are scattered, though not in great numbers, through Germany, Denmark, Sweden, and Russia; but their chief population is in the south-east parts of Europe, which seem to be the general rendezvous of the gypsy nation. At a moderate computation Europe contains more than seven hundred thousand of these vagabonds. For near four centuries they have wandered through the world; and in every region, and among every people, whether barbarous or civilized, they have continued equally unchanged by the lapse of time, the variation of climate, and the force of example. Their singular physiognomy and particular manners are the same in every coun-

try. Their swarthy complexion derives no darker shade from the burning sun of Africa, nor any fairer tincture from the temperate climates of Europe; they contract no additional laziness in Spain, nor acquire any new industry in England; in Turkey they behold the mosque and the crescent with equal indifference as they do the reformed and the catholic church in Europe. In the neighbourhood of civilized life they continue barbarous; and, beholding around them cities and settled inhabitants, they live in tents or holes in the earth, and wander from place to place as fugitives and vagabonds.

They are passionately fond of ornaments; in which, however, they consult neither propriety nor consistency; they will wear an old laced coat, while the rest of the garments scarcely hang together. In Hungary and Transylvania their summer habitations are tents; their winter ones, holes ten or twelve feet deep in the earth; except such as keep inns, or exercise trades. They are fond of plate, particularly silver cups, which they bury under the earth for security. Their principal occupations are, smith's work, or tinkers, or wooden ware, and horse dealing; and in Hungary and Transylvania they are executioners of criminals, flayers of dead beasts, and washers of gold. The women deal in old clothes, prostitution, wanton dances, and fortune-telling. Notwithstanding these occupations, the majority of this people are lazy, beggars, and thieves. They bring up their children to their own professions, and are very fond of them. They have few disorders, except the measles and small-pox, and weaknesses in their eyes, occasioned by the smoke, and live to an advanced age, with a strong attachment to life. Their physic is saffron in their soups, or bleeding.

The gypsies have, at least in Transylvania, a sort of regular government, rather nominal than real or effective. They have their leaders or chiefs, whom they distinguish by the Sclavonian title, waywode. To this dignity every person is eligible who is of a family descended from a former waywode; but the preference is generally given to those who have the best clothes and the most wealth, who are of a large stature, and not past the meridian of life. Of religion, however, they have no sense; though, with their usual cunning and hypocrisy, they profess the established faith of every country in which they live. They also speak the languages of the respective countries, yet have a language of their own; from whence derived, authors differ. Mr. Whiter, the author of the Etymologicon Magnum, is of opinion that the gypsy language may be considered as the most ancient form of speech now extant in the world. It has been imagined that this language is a dialect of the Sanscrit; and Mr. W. regards it as the important link by which the Sanscrit is connected with the Coptic, or the Egyptian.

Their general character and capacities are thus described: Imagine people of a childish way of thinking; their minds filled with raw, undigested conceptions; guided more by sense than reason; using understanding and reflection so far only as they promote the gratification of any particular appetite; and you have a perfect sketch of the gypsy character. They are lively, uncommonly loquacious and chattering; fickle in the extreme, consequently inconstant in their pursuits; faithless to every body, even their own cast; void of the least emotion of gratitude, frequently rewarding benefits with the most insidious malice. Fear makes them slavishly compliant when under subjection; but, having nothing to apprehend, like other timorous people, they are cruel. Desire of revenge often causes them to take the most desperate resolutions. They are so addicted to drinking, as to sacrifice what is most necessary to them, that they may feast their palates with spirits.

GYPSUM, in mineralogy, a genus of the class earths, order calcareous: consisting of carbonat of lime united to sulphuric acid; light, very soft, a little frigid: not commonly effervescing with nitric acid, melting with difficulty in the fire, but easily crumbling to powder; which produces no ebullition in water, but forms a paste hardening and distending by exposure to the air. Eighteen species, found chiefly in Europe, but one or two species in Asia, especially in the Persian territories. The following are the chief.

1. G. terreum. Farinaceous gypsum. Powdery, of a white colour. Found in the fissures of gypseous rocks in Saxony in the form of a white friable, loose, powdery substance, and seems to originate from crystallized seilenite, and will not concrete without being moistened; feels dry and meagre, hardly sinks in water, is not gritty between the teeth; when heated below redness it becomes of a dazzling white; has no lustre or transparency.

2. G. alabastrum. Alabaster. Compact, dry and meagre; a little shining; breaking into indeterminate fragments, of a common form, receiving a polish. Found in Derbyshire, Persia, and various parts of Russia, Spain, Tuscany, Sicily and other places, in stratified mountains: colour various, sometimes spotted, intersected with veins and depicted with various colours: does not effervesce with acids; when pure is softer than marble, and does not take a good polish.

3. G. fibrosum. Sulphat of lime. Plaister of Paris. Meagre and dry; brittle; breaking into long splintery fragments; of a common form.

β. There is another variety very transparent, fixed, united.

γ. A third variety. Obscure, fixed, with decussate ramentations.

Found in various parts of Britain and Europe in general; and according to Mr. Sowerby is formed by the decomposition of sulphur of iron or pyrite, the sulphur of which combining with oxygen forms sulphuric acid; which again coming in contact with lime forms this gypsum in various fanciful modes of a texture fibrous, filamentous, or radiate,

flexuous or straight, parallel or scattered; colour white, grey, yellowish, red, or honey-hued, with the colours sometimes meeting in stripes.

4. G. usuale. Lamellated gypsum. Foliated gypsum. Meagre and dry, lamellar, with the foliations generally spherical; breaking into indeterminate fragments.

β. Another variety glittering internally.

γ. A third without internal lustre. Found in Britain and various other parts of Europe in vast masses, and sometimes in lenticular crystals: colour yellowish, or blackish-grey, cinereous, ochraceous, flesh-colour, rarely honey-colour.

5. G. selenites. Selenite. Selenitic spar. Sulphat of lime. Pellucid, shining, rhombic, lamellar, with straight parallel foliations, breaking into rhomboidal fragments. Found in most places in which the two preceding species exist, with the crystals generally in six-sided prisms, terminated by two-sided or four-sided summits; it commonly produces double refraction; colour white or grey.

GYR-FALCON, in ornithology. See FALCO.

GYRATION. *s.* (*gyro*, Lat.) The act of turning any thing about.

GYRATION. (Centre of.) See CENTRE.

GYRE. *s.* (*gyrus*, Latin.) A circle described by any thing moving in an orbit (*Sandys*).

GY'RED. *a.* Falling in rings (*Shakspeare*).

GY'RINUS. Water flea. In zoology, a genus of the class insectæ, order coleoptera. Antennas cylindric; jaws horny, one-toothed, sharp-pointed; eyes four, two above and two beneath: thorax and shells margined, the latter shorter than the body; legs formed for swimming. Eleven species, scattered over the four quarters of the globe. They are found on the surface of waters, on which they run and describe circles with great celerity; when attempted to be taken they plunge to the bottom, drawing after them a bubble resembling a globule of quicksilver.

The only species found in our own country is G. natator, which is oval, faintly striate, black. It inhabits the surface of our stagnant pools. It is extremely active even in its larva state, in which it evinces six legs and a lengthened body; it preys on the smaller and weaker water-insects, minute worms, &c. On the approach of its farther metamorphosis it forms for itself a small oval cell or case on a sedge-leaf or other water-plant, and casting its skin becomes a chrysalis: this change usually takes place in the month of August, and the aurelia is completely entomized in September. These insects, when largely assembled together on the surface of the water in hot weather, have been observed to diffuse a strong or disagreeable smell to a considerable distance. Like the hydrophil and dytiscus, they fly only by night. Their eggs are small, white, and cylindric; and are deposited on the leaves of water-plants: the heat of the sun hatches them in the space of about eight days, when the young larva instantly begins to swim about in pursuit of its prey.

GYVES. *s.* (*gevyn*, Welsh.) Fetters; chains for the legs (*Ben Jonson*).

To GYVE. *v. a.* To fetter; to shackle (*Shakspeare*).

H.

H, THE eighth letter, and sixth consonant in our alphabet; though some grammarians will have it to be only an aspiration, or breathing. But nothing can be more ridiculous than to dispute its being a distinct sound, and formed in a particular manner by the organs of speech, at least in our language: witness the words *eat* and *heat*, *arm* and *harm*, *ear* and *hear*, *then* and *ten*, &c. as pronounced with or without the *h*. It is pronounced by a strong exspiration of the breath between the lips, closing, as it were, by a gentle motion of the lower jaw to the upper, and the tongue nearly approaching the palate.

The Latins have taken their H from the Greek ἦτα, as the Greeks had it of the Phœnicians, and the Phœnicians of the Syrians, who pronounced formerly *Hetha* instead of *Heth*: which plainly shews, that we ought to pronounce *Eta* in Greek and not *Ita*.

But in the beginning this H was only used for an aspiration, wherefore they wrote HEΡΟΔΟ instead of ηρωδου, HOΔOI instead of οδω, HEKATON instead of εκατον *centum*: from whence it comes, that the H formerly denoted one hundred in number.

H was also joined with weak consonants instead of an aspiration; for the aspirated consonants were found out since by Palamedes, they using to write THEOΣ instead of Θεος, and the like.

The F is often written instead of the H, as *fædum* instead of *hædum*, *fircum* instead of *hircum*, *fariolum* instead of *hariolum*, *fostem* instead of *hostem*, *heminas* instead of *feminas*, *hebris* instead of *febris*.

Anciently the *h* was put for *ch*; thus *Chlodovæus* was formed *Hludovicus*, as it is read on all the coins of the ninth and tenth centuries; and it was on this account that they wrote *Hludovicus* with an *h*. In course of time, the sound of the *h* being much weakened, or entirely suppressed, the *h* was dropt, and the word was written *Ludovicus*. In like manner we read *Hlotaire*, *Hlovis*, &c. F. Lobineau will have this difference to have risen from the differences in the pronunciation. Such, says he, as could not pronounce the guttural, wherewith these two words begin, substituted a *c* for it; and they who pronounced it so, wrote it after the same manner; but such as were accustomed to pronounce the guttural, wrote it likewise. He might have added, that such as could not pronounce it at length absolutely rejected it, and both wrote and spoke *Louis*, *Lotaire*, &c. Some learned men have conjectured that the *h* should have been detached from the name; and that it signified lord, from the Latin *herus*, or the German *herr*. Much as the D, which the Spaniards prefix to their proper names, as *D. Phelipe*, for Don Philip. But as it is likewise found before the names of several cities, it is more probable the letter was there used to denote the roughly harsh pronunciation of the ancient Franks.

In reality, the most ancient way of writing the names of these French kings, was not by *h*, but by *ch*; where the *c* seems to have stood for *koning*, *king*, and the *h* was inserted to give the *c* a guttural sound.

The *h* is sometimes also found prefixed to the *c*; as *Hcarolus*, *hcalendæ*, &c. for *Carolus*, *calendæ*, &c.

H, when it begins the first syllable of a word, is generally sounded with a full breath; the exceptions are *heir*, *herb*, *hostler*, *honour*, *humble*, *honest*, and their derivatives. It is now customary with many of our best speakers to pronounce several words beginning with *hu*, as though they were spelt *yu*, as *human*, *humility*, *humour*, and their derivatives. The English anciently aspirated less than at present, as is manifest from the directions given by the grammarians of the seventh century to use *an* universally before *H*.

H, used as a numeral, denotes 200; and with a dash over it, H̄, 200,000.

As an abbreviation, H was used by the ancients to denote *homo*, *hæres*, *hora*, &c. Thus H.B. stood for *hæres bonorum*; and H.S. corruptly for LLS. *sesterce*; and H. A. for *Hadrianus*.

HA. *interjection.* (*ha*, Latin.) 1. An expression of wonder, surprise, sudden question, or sudden exertion (*Shakspeare*). 2. An expression of laughter (*Dryden*).

HABAKKUK, one of the twelve lesser prophets, whose prophecies are taken into the canon of the Old Testament. The name is written in the Hebrew with the ח *kheth*, and signifies "a wrestler." There is no precise time mentioned in Scripture when this Habakkuk lived; but from his predicting the ruin of the Jews by the Chaldeans, it may be concluded that he prophesied before Zedekiah, or about the time of Manasseh. He is reported to have been the author of several prophesies which are not extant: but those that are indisputably his are contained in three chapters. His style is very grand and beautiful.

HABAT, a province of Africa, in Barbary, and in the kingdom of Fez. It is bounded by the Mediterranean, the Straits of Gibraltar, and the Atlantic Ocean.

HABDALA, a ceremony of the Jews, observed on the evening of the sabbath, and

by which is intended that the sabbath is over, and the day of labour begun.

HABEAS CORPUS, a writ, of various uses, and of different importance. It was originally a writ, which a man indicted of a trespass before justices of the peace, or in a court of franchise, and being apprehended for it, may have out of the King's Bench, to remove himself thither at his own costs, and to answer the cause there. In its more usual sense it is the most celebrated writ in the English law. This writ formed part of the ancient common law, but was much more restrained in its operation and effects: for the judges arrogated to themselves the power of granting or denying it: and the gaolers did not pay a proper attention to it, often putting the sufferer to the expence of an alias and pluries habeas corpus before they obeyed. These inconveniences produced the famous statute 31 Car. II. c. 2.

This great bulwark of English liberty, which may fairly be put upon a level with the celebrated Magna Charta, was occasioned by the unjust oppression of an insignificant individual in the reign of Charles the Second. The statute enacts,

1st. That the lord chancellor, or any of the judges in vacation, on complaint or written request of any person committed for any crime (except felony, or treason, or as accessary, or suspected of being accessary before the fact, to any petty treason, or felony, or charged in execution by legal process), upon seeing a copy of the warrant, or affidavit that copy is denied, shall award a habeas corpus for such prisoner, returnable immediately before himself, or any other of the judges (unless the party has suffered two terms to elapse before applying to the court for his liberation), and shall discharge the party, if bailable, on his giving proper security to appear.

2dly. That the writ shall be indorsed, as granted in pursuance of this act, and signed by the person awarding it.

3dly. That the writ shall be returned, and the prisoner brought up in a limited time, according to the distance, never exceeding 20 days.

4thly. That officers and keepers not making due returns, or not delivering to the party or his agent, within six hours after demand, a copy of the warrant of commitment, or shifting the custody of a prisoner without proper authority (as mentioned in the act), shall forfeit 100l. for the first offence, and 200l. for the second, to the sufferer, and be disabled from holding such office.

5thly. That any one detaining a person once delivered by habeas corpus for the same offence, shall forfeit 500l.

6thly. That every person committed for treason or felony shall, if he desires it, the first week of the next term, or the first day of the next session of oyer and terminer, be indicted in that term or session, or else admitted to bail, unless the witnesses for the crown cannot be produced at that time; and if acquitted, or not indicted, and tried in the second term or session, shall be discharged; but no person after the commencement of assizes for the county where he is detained, shall be removed by habeas corpus till they are ended.

7thly. That a prisoner can obtain his habeus corpus out of the chancery, and exchequer, as well as out of the king's bench and common pleas: and if the chancellor and judges shall refuse the same on sight of the warrant or oath that it is denied, shall forfeit severally 500l. to the party grieved.

8thly. That this writ of habeas corpus shall run into the counties palatine, and all other privileged places, and the islands of Guernsey and Jersey.

9thly. That no inhabitants of England (unless at their desire, or having committed some capital offence in the place to which they are sent), shall be sent prisoners to Ireland, Scotland, Guernsey, and Jersey, or any places beyond the seas, within or without his majesty's dominions, on pain that the person committing, and his advisers and abettors, shall forfeit to the injured party a sum not less than 500l. to be recovered with treble costs, shall be disabled from holding any office, shall incur the penalties of præmunire, and be incapable of the king's pardon.

The writs in use under this act are various. Many kinds are used for removing prisoners from one court to another. Such are the *habeas corpus ad respondendum*, when a man has cause of action against one who is confined by process of an inferior court, in order to remove the prisoner, and charge him with this new action in the court above. *Ad satisfaciendum* is when judgment has, in an action, been given against a prisoner; and the plaintiff brings him up to a superior court to charge him with process of execution. Also the writs *ad prosequendum, testificandum, deliberandum*, which issue when it is necessary to remove a prisoner, in order to prosecute, or bear testimony, or to be tried in the proper jurisdiction wherein the fact was committed. And, lastly, the common writ *ad faciendum et recipiendum*, which issues out of any of the courts above, when a person is sued in some inferior jurisdiction, and desires to remove the action into the superior court, commanding the inferior judges to produce the body of the defendant, with the day and cause of his detainer, to do and receive what the king's court shall determine. This writ is grantable of common right, without moving the court, and supersedes all inferior proceedings. But to prevent the surreptitious discharge of prisoners, the statute 1 and 2 P. and M. c. 13, enacts, that no habeas corpus shall issue to remove any prisoner out of gaol, unless signed by some judge of the court out of which it is awarded. And by a statute of the present reign it is enacted, that no cause under the value of 10l. shall be removed into a superior court, unless the defendant, on removing the same, gives security for payment of debt and costs.

But the writ which forms so great a part of

the liberty of the subject in all manner of illegal confinement, is the *habeas corpus ad subjiciendum*, commanding the person detaining a prisoner to produce him, with the day and cause of his detention, to submit to whatever the judge or court awarding such writ shall determine. This is a high prerogative writ, and therefore, by the common law, issuing out of the court of king's bench, not only in term time, but vacation, by a fiat from any of the judges, and running into all the king's dominions. And a man has now the benefit of the common law writ, either in the king's bench or common pleas, as he chooses; and in both those courts it is necessary to apply for it by motion, as it does not issue of course, without shewing some reason for the granting it. But if good grounds be shewn that the party is imprisoned without just cause, it becomes a writ of common right, and must not be denied, even though a man is detained by the highest authority.

This celebrated act has been subject to temporary suspensions, by authority of parliament, in times of riot or rebellion; and the late minister subjected himself to considerable unpopularity by that measure during the last war.

HABENDUM, in a deed, that formal part of it which is to determine what estate or interest is granted by it, the certainty thereof, for what time, and to what use. It is expressed by the words "to have and to hold for such a term," &c. It sometimes qualifies the estate, so that the general extent which, by construction of law, passes by the words used in the premises, may by the habendum be controlled. The habendum may, therefore, lessen or enlarge the estate previously granted, but it cannot totally contradict or be repugnant to it. As if a grant be to one, and the heirs of his body, habendum, to have to him and his heirs for ever, here he has an estate tail by the grant; and by the habendum a fee-simple expectant thereon. But if it had been in the premises to him and his heirs to have for life, the habendum would be utterly void; for an estate of inheritance is vested in him before the habendum comes, and shall not afterwards be taken away, or divested by it. The habendum cannot pass any thing that is not expressly mentioned, or contained by implication, in the premises of the deed: because the premises being part of the deed by which the thing is granted, and consequently that makes the gift; it follows, that the habendum, which only limits the certainty and extent of the estate in the thing given, cannot increase or multiply the gift, because it were absurd to say, that the grantee shall hold a thing which was never given him. See DEED.

HABERDASHER, in commerce, a seller of hats, and other small wares. This word is probably derived from BERDASH.

HABERGEON, HAUBERGEON, or HABERGETUM, a coat of mail. An ancient piece of armour, in form of a coat, descending from the neck to the middle, and formed of little iron rings or plates, linked into each other.

HABI'LIMENT. *s.* (*habilement*, French.) Dress; clothes; garment (*Swift*).

To HABI'LITATE. *v. n.* (*habiliter*, Fr.). To qualify; to entitle: not in use (*Bacon*).

HABILITATION. *s.* (from *habilitate.*) Qualification (*Bacon*).

HABI'LITY. *s.* (*habilité*, French.) Faculty; power: now *ability*.

HA'BIT. *s.* (*habitus*, Latin.) 1. State of any thing: as, *habit* of body. 2. Dress; accoutrement (*Dryden*). 3. *Habit* is a power in man of doing any thing, when it has been acquired by frequent doing the same thing (*Locke*). 4. Custom; inveterate use (*South*).

To HABIT. *v. a.* (from the noun.) To dress; to accoutre; to array (*Clarendon*).

HABIT, may be defined an aptitude or disposition either of mind or body, acquired by a frequent repetition of the same act.

Similar to the customs (see CUSTOM) which pervade large bodies of men, is the power of habit over individuals. The mind frequently acquires a strong and invincible attachment to whatever has been familiar to it for any length of time. Habits primarily introduced by accident or necessity, will inspire an affection for peculiarities which have the reverse of intrinsic merit to recommend them. These become, as it were, assimulated to our natures; we contemplate them as belonging to ourselves so intimately, that we feel an irksome vacuity in their absence, and enjoy a great degree of satisfaction in their being replaced; merely because we have been habituated to them. How frequently does it happen that the most trifling circumstances in early life will decide the lot of our future years; creating affections and aversions which have the most lasting influence! It is this cause which so frequently inspires a preference for one trade, pursuit, or profession, rather than another. Thus we perceive that children sometimes make choice of the employments of their parents or their neighbours, because it had agreeably engaged the attention of their juvenile hours. They love to imitate and play the man, till an affection is acquired for the occupation itself. This is generally the case where the occupation is of an active nature, and most adapted to the vivacity of youth. If, on the other hand, their minds are strongly impressed with the confinement, slavery, or any other disagreeable circumstance attending the employment to which they are daily witnesses, they are inclined to the contrary extreme, contract an aversion, and give the preference to any other pursuit, the inconveniences of which are unknown to them.

It is needless to enlarge farther upon these particulars; as every individual must be conscious of their truth. There is no one who does not feel the force of habit, both as the source of pleasure and of displeasure. It is experienced in every station and connection in life; it is experienced in what we eat, or drink, or wherewith we are clothed; in our habita-

tions and their furniture; and in our own characteristic peculiarities. (*Cogan on the Passions*, p. 237.)

HABIT OF PLANTS, their air, port, or general external appearance. Linnéus defines it to be, a certain conformity which kindred or congenerous vegetables have in their placentation, rooting, branching, intorsion, budding, leafing, stipulation, pubescence, glandulation, lactescence, florescence, &c.

Hence such characters are called characteres habituales. And these, though not sufficient of themselves to distinguish vegetables, yet frequently make them known at first sight. Many of the natural classes are directly apparent from this general similitude, as the caryophylleæ, verticillatæ, asperifoliæ, umbellatæ, leguminosæ, siliquosæ, columniferæ, filices. In forming the characters of the genus these have been neglected, since the fructification has been thought amply sufficient for the purpose.

HA'BITABLE. *a.* (*habitable*, Fr.) Capable of being dwelt in (*Donne*).

HA'BITABLENESS. *s.* (from *habitable.*) Capacity of being dwelt in (*More*).

HA'BITANCE. *s.* (*habitatio*, Latin.) Dwelling; abode (*Spenser*).

HA'BITANT. *s.* (*habitant*, Fr.) Dweller; one that lives in any place (*Pope*).

HABITA'TION. *s.* (*habitation*, French.) 1. The state of a place receiving dwellers (*Milton*). 2. Act of inhabiting; state of dwelling. 3. Place of abode; dwelling (*Milton*).

HABITATION OF PLANTS. In botany. Locus ubi sponte prognascuntur. Their native place of growth. Called by some, barbarously and vulgarly, their *habitat.*

HABITA'TOR. *s.* (Latin.) Dweller; inhabitant (*Broome*).

HABI'TUAL. *a.* (*habituel*, French.) Customary; accustomed; inveterate (*South*).

HABI'TUALLY. *ad.* (from *habitual.*) Customarily; by habit (*Arbuthnot*).

To HABI'TUATE. *v. a.* (*habiteur*, Fr.). To accustom; to use one's self by frequent repetition (*Tillotson*).

HA'BITUDE. *s.* (*habitudo*, Latin.) 1. Relation; respect; state with regard to something else (*Hale*). 2. Familiarity; converse; frequent intercourse (*Dryden*). 3. Long custom; habit (*Prior*). 4. The power of doing any thing acquired by frequent repetition (*Dryden*).

HA'BNAB. *ad.* (*hap ne hap.*) At random; at the mercy of chance (*Hudibras*).

HABSBURG, or HAPSBURG, a castle of Swisserland, in the canton of Berne, advantageously situated on the right bank of the Aar, about a league above the town of Bruck, built by count Vernor, bishop of Strasburg, in the eleventh century, and by him given to his brother Radbad. The son of Radbad, sirnamed Verner, after his uncle, was the first of the house who took the title of the count of Habsburg, which his descendants always bore till the elevation of Rodolph I. to the empire of Germany, and archduchy of Austria. It was then given as a fief to the lords of Wildeck, and after them to the lords of Wholen. When the Bernois conquered the Argow, in 1415, this castle came under their dominion. An officer is stationed here to give the alarm, in case a fire should break out in the neighbourhood: five miles N. Lenzburg.

HACHA, the capital of Rio-de-la-Hacha, a small province of Terra Firma. It is seated at the mouth of a river of the same name. Lat. 11. 30 N. Lon. 72. 34 W.

To HACK. *v. a.* (haccan, Saxon.) 1. To cut into small pieces; to chop (*Sidney*). 2. To speak unreadily, or with hesitation (*Shakspeare*).

To HACK. *v. n.* To turn hackney or prostitute (*Shakspeare*).

HACK, applied to horses, means a horse appropriated to every kind of drudgery, and upon which no great estimation or value is placed. The term also implies a hired horse; the property of a hackney-man, job or postmaster, who lets out horses by the day, week, or month, and who is obliged to take out an annual licence for permission so to do, paying five shillings for the same; without which licence he is liable to a penalty of ten pounds.

Hack-horses, whether for riding or drawing post, are chargeable with a duty of one penny halfpenny per mile, for as many miles as such horse shall be engaged to travel within a day, or any less time; but where the distance cannot be ascertained, one shilling and nine-pence is charged in the gross. This duty is demanded by the person letting the horse or horses to hire, who, upon receiving such payment, is compellable to deliver to the person so hiring one or more stamp-office tickets, under a penalty of ten pounds.

HA'CKLE. *s.* Raw silk; any flimsy substance unspun (*Walton*).

To HA'CKLE. *v. a.* To dress flax.

HACKNEY, a parish in Middlesex, on the N.E. side of London, containing no less than 12 hamlets. The old church was built, we believe, in the reign of Edward II. Near it there has been a large church lately erected. That part of Hackney next London is called Mare-street, the middle Church-street, and the north part Clapton. Dorleston and Shacklewell are on the west, and Hommerton, which leads to the marsh, on the east. Hackney coaches first obtained their name from this place: for in the beginning of the seventeenth century, Londoners who went on visits to their friends at Hackney often hired horses or carriages, so that in time it became a common name for such horses, chaises, and coaches, as were let to the people of London; and the name is now general.

HACKNEY, among sportsmen, a road-horse superior to all others upon the score of utility, and employed to save the drudgery and labour of the more pampered racer, the hunter, and the charger. It is the peculiar province of the hackney to carry his master twelve or fifteen miles in an hour to covert, when the hunter

is in waiting; and sometimes to bring back the groom with still greater expedition. His constitution, therefore, is required to be good, and his spirit invincible; he must be enabled to go five and twenty or thirty miles at a stage without drawing bit, or the least respect to the state of the roads or the weather.

HACKNEY, is used to denote, further, 2. A hireling; a prostitute; (*Roscommon*). 3. Any thing let out for hire (*Pope*). 4. Much used; common (*Harvey*).

To HA'CKNEY. *v. a.* (from the noun.) To practise in one thing; to accustom, as to the road (*Shakspeare*).

HACKNEY-COACHES, those exposed to hire in the streets of London, and some other great towns and cities, as Edinburgh, Liverpool, Bristol, &c. at certain rates fixed by authority. (See COACH.) These first began to ply in the streets of London, or rather waited at inns, in the year 1625, and were originally no more than twenty in number. The following is a correct table of the present fares.

FARES ACCORDING TO DISTANCE.

	£.	s.	d.
Not exceeding one mile	0	1	0
One mile and a half	0	1	6
Two miles . . .	0	2	0
Two miles and a half	0	3	0
Three miles . . .	0	3	6
Three miles and a half	0	4	0
Four miles . . .	0	4	6
Four miles and a half	0	5	6
Five miles. . . .	0	6	0
Five miles and a half	0	6	6
Six miles	0	7	0
Six miles and a half	0	8	0
Seven miles . . .	0	8	6
Seven miles and a half	0	9	0
Eight miles . . .	0	9	6
Eight miles and a half	0	10	6
Nine miles . . .	0	11	0
Nine miles and a half	0	11	6
Ten miles	0	12	0
Ten miles and a half	0	13	0
Eleven miles . . .	0	13	6
Eleven miles and a half	0	14	0
Twelve miles . . .	0	15	0

And so on at the rate of 6d. for every half mile, and an additional 6d. for every two miles completed.

FARES ACCORDING TO TIME.

	£.	s.	d.
Not exceeding thirty minutes . .	0	1	0
Forty-five minutes .	0	1	6
One hour	0	2	0
One hour and twenty minutes . . .	0	3	0
One, hour and forty minutes	0	4	0
Two hours . . .	0	5	0
Two hours and twenty minutes . . .	0	6	0
Not exceeding two hours and forty minutes. . . .	0	7	0
Three hours . . .	0	8	0
Three hours and twenty minutes . . .	0	9	
Three hours and forty minutes. . . .	0	10	0
Four hours . . .	0	11	0

And so on at the rate of sixpence for every fifteeen minutes further time.

The fares are to be taken by the hour or mile only, and not by the day.

The sun-set hours, after which coaches are obliged to go on the lighted roads, shall be after eight between Lady Day and Michaelmas, and after five between Michaelmas and Lady Day; and coaches discharged after such hours beyond the carriage-way pavement, shall, besides the above fares, have the full fare to the extremity of such pavement; or if hired a stand beyond the same, the full fare back such extremity or standing, at the option the party.

For coaches hired to go into the country in the day-time and there discharged, additional fares are to be taken for their return empty to the pavement or next stand where hired from, as follows: for ten miles, five shillings; eight miles, four shillings; six miles, three shillings; and four miles, two shillings. If under four miles, nothing.

Coachmen are not compellable to take more than four adult persons inside and a servant out; but if they agree to take more, then one shilling in addition to the fare must be paid for each extra person; and if the coach is hired for the country, and to return, one shilling for such extra person going, and one shilling for his returning.

Visitors of Vauxhall, and other places of public resort, ordering coaches to wait, must pay a reasonable sum in hand, to be accounted for when the coach is discharged.

Coachmen summoned for refusing to go with fares, who can prove that they have been twelve hours at work, or were at the time actually hired, and it appearing that they did not use any uncivil language, or mis-conduct themselves, are not to be punished for such refusal; but, on the contrary, receive from the party complaining a compensation for loss of time, not exceeding five shillings, nor less than three shillings.

Every coach shall have its number on each side; and if any proprietor shall presume to alter his number he shall forfeit 5l. half to the king, and half to the informer. The horses to be used with hackney-coaches shall not be under fourteen hands high.

Any coachman refusing to go at, or exacting more for his hire than according to the foregoing rates, shall forfeit a sum not exceeding three pounds or under ten shillings; and in case of misbehaviour by abusive language or otherwise, the commissioners may revoke

his licence, or inflict a penalty not exceeding three pounds to the poor, and on non-payment, to be committed and kept to hard labour for thirty days.

Any person refusing to pay the fare, or defacing the coach, may be brought by warrant before any justice, who, on proof upon oath, may award satisfaction to the party; and in case of refusal to pay, may bind him over to the next sessions.

The penalties to be levied by distress, and, in default thereof, imprisonment till paid; and if any rent is fourteen days unpaid, the licence may be withdrawn.

A coach should be taken possession of before the coachman is told where to drive; if he then refuses to proceed he is liable to be punished; and if at any time you apprehend that more than the proper fare is demanded, you may offer whatever is asked, but charge the coachman to take no more than is due; and if he then persists in the overcharge and takes it, you may take his number and apply for redress at the Hackney-Coach Office, in Somerset-place; though the penalties are equally recoverable before the alderman of every ward of the city, or any justice of peace.

HA'CQUETON. *s.* (*haquet*, old French.) Some piece of armour (*Spenser*).

HAD. The preterit and part. pass. of *have*.

HADBOTE, in our old writers, a recompence or amends for violence offered to persons in holy orders.

HADDINGTON, a borough of Scotland, in a county of the same name. Part of a monastery here is occupied as a parish church; and at a small distance are the ruins of a nunnery. Lat. 55. 50 N. Lon. 2. 35 W.

HADDINGTONSHIRE, or East Lothian, a county of Scotland, bounded on the W. by Edinburghshire, on the N. by the frith of Forth, on the E. by the German Ocean, and on the S. by the county of Berwick. It is about twenty-five miles long from E to W. and fifteen miles where broadest. A great tract of this county, extending to the S. and E. is for the most part champaign, and very fertile and beautiful. The soil is, in many places, doubly productive. Rich crops are raised on the surface; and the mines of coal are inexhaustible. The southern part of this county is very mountainous. In 1801 this county contained 29986 inhabitants.

HADDOCK, in ichthyology. See Gadus.

HADDON (Dr. Walter), a learned Englishman, born in Buckinghamshire in 1516, and educated at Eton school, from whence he was sent to King's college, Cambridge, where he took his doctor's degree in civil law. He was one of the most zealous promoters of the reformation, which brought him into some danger in the reign of queen Mary. On the accession of Elizabeth, he was made master of the court of requests. He was also employed on state affairs. He died in 1571. His miscellaneous works were printed in 1567, in 4to. under the title of Lucubrations.

HADES, the Greek term used in Scripture for the unseen state. See Ades.

HADLEY, or Hadleigh, a borough in Suffolk, with a market on Mondays. It is governed by a mayor, and has a very handsome church. Large quantities of yarn are spun here for the Norwich manufacture. Lat. 52. 10 N. Lon. 1. 6 E.

HADRIAN. See Adrian.

HADRIANEA, in antiquity, games observed at Puzzuoli, in honour of the emperor Adrian.

HADSJAR, or Lachsa, a province of Arabia, bounded on the north by Arabia Deserta, on the east by the Persian Gulf, on the south by Oman, and on the west by Nedsjed. The asses and camels of this country are much valued, and some thousands of the latter annually sold into Syria. In the interior parts of the country dates form a principal branch of the food of the inhabitants. Pearl-fishing on the coasts produces considerable advantage, and there is some foreign trade. Lachsa is the capital.

HÆ'MA. (αιμα, from αιθω, to burn, because of its heat.) Blood. This word forms the commencement of a great variety of compound terms in medicine.

HÆMAGOGOS, (of αιμα, blood, and αγω, I draw away.) The name of a medicinal composition described in Myrepsus, and intended to bring away the lochia, or forward the menstrual discharges. It consists of black hellebore and the fœtid gums, with honey.

HÆMANTHUS. Blood-flower. In botany, a genus of the class hexandria, order monogynia. Involucre many-leaved, many-flowered; corol superior, six-parted; berry three-celled. Fourteen species: all Cape plants, excepting one, which is indigenous to Sierra Leone. The following are the chief.

1. H. coccineus. Leaves tongue-shaped, flat, smooth, pressed close to the ground: umbel contracted, fastigiate, shorter than the involucre; border of the corol spreading. The leaves are produced in the autumn, continue through the winter, and decay in the spring; the plant through the summer being leafless. The flowers precede the leaves in the autumnal season.

2. H. multiflorus. Leaves elliptic, lanceolate, acute, concave, erect; umbel many-flowered, longer than the involucre; peduncles jointed; border spreading; stamens ascending. This is the only species of the genus which has hitherto been found wild in any other part than the Cape. It is described by Seba as a native of Sierra Leone.

3. H. carinatus. Leaves linear, and hollowed like the keel of a boat: stalk taller and flowers paler than those of H. coccineus, or the cochineal blood-flower.

HÆMATE'MASIS. (*hæmatemasis*, from αιμα, blood, and εμεω, to vomit.) Vomitus cruentius. A vomiting of blood. This disease is mostly symptomatic of some other, and generally arises from plethora, obstructed catamenia, or scurvy.

HÆMATITES, in oryctology. See FERRUM.

HÆMATOCELE. (*hæmatocele*, from αιμα, blood, and κηλη, a tumour.) A collection of blood in the tunica vaginalis, testis, or in the cellular membrane of the scrotum. It generally takes place from puncturing a blood-vessel in the operation for removing the water of hydrocele. If the quantity be great, and the efflux be not stopped by cold applications, the bleeding vessel should be secured.

HÆMATOLOGY. (*hæmatologia*, αιματολογια, from αιμα, blood, and λογος, a discourse.) The doctrine of the blood.

HÆMATOMPHALOCELE. (*hematomphalocele*, αιματομφαλοκηλη; from αιμα, blood, ομφαλος, the navel, and κηλη, a tumour). A species of ecchymosis. A tumor about the navel from an extravasation of blood. It is mostly absorbed, but, if too considerable, a puncture may be made to evacuate the blood, as in ecchymosis. See ECCHYMOSIS.

HÆMATOPUS. Sea-pie. Pied oyster-catcher. In zoology, a genus of the class aves, order grallæ. Bill compressed, the tip an equal wedge; nostrils linear; tongue a third part as long as the bill, feet formed for running, three-toed, cleft. One species. H. ostralegus, with red bill, eyelids and legs, the former sometimes tipt with black; scarlet irids; body sometimes totally black, frequently head, neck, and body above black, beneath white. Inhabits almost every sea-shore; and is, of course, found on the coasts of our own country; sixteen and a half inches long; feeds on marine worms and insects, but chiefly on oysters and limpets, which it extracts from the shells with great dexterity: eggs four or five, olive-yellow, with irregular purplish spots. See Nat. Hist. Pl. XIV.

HÆMATOXYLON. Logwood. Campeachy. In botany, a genus of the class decandria, order monogynia. Calyx five-parted; petals five; capsule lanceolate, one-celled, two-valved, the valves boat-shaped. One species, a native of the bay of Campechy, at Honduras; a tree rising from eighteen to twenty or five and twenty feet, with crooked spinous branches; leaves abruptly pinnate; leaflets inversely heart-shaped; flowers racemed. It is still in frequent use in medicine under the name of LIGNUM CAMPECHIENSE, which see for its medicinal powers.

In dyeing many of the darker colours, logwood is of very essential use, and a very common ingredient. It is, of especial use in dyeing black, adding a permanency as well as a depth of colour to the black of galls and vitriol, when intermixed with them, which they never possess of themselves.

HÆMATURIA. (*hæmaturia*, αιματουρια: from αιμα, blood, and ουρον, urine.) Bloody urine; mostly symptomatic of some other disease.

HÆMODORUM. In botany, a genus of the class triandria, order monogynia. Petals six; the interior ones bearing the stamens above the middle: stigma-obtuse; capsule inferior, three-celled. One species only; a glabrous herb of Australasia, with a scarlet inflorescence.

HÆMOPTYSIS. (*hæmoptysis*, αιμοπτυσις; from αιμα, blood, and πτυω, to spit.) Hæmoptoe. A spitting of blood. A genus of disease, arranged by Cullen in the class pyrexiæ, and order hæmorrhagiæ. It is characterized by coughing up florid or frothy blood, heat or pain in the chest, irritation in the larynx, and a saltish taste in the mouth. There are five species of this disease: 1. Hæmoptysis plethorica, from fullness of the vessels. 2. Hæmoptysis violenta, from some external violence. 3. Hæmoptysis phthisica, from ulcers corroding the small vessels. 4. Hæmoptysis calculosa, from calculous matter in the lungs. 5. Hæmoptysis vicaria, from the suppression of some customary evacuation.

HÆMORRHAGIA. (*hæmorhagiæ*, αιμοῤῥαγια; from αιμα, blood, and ῥηγνυμι, to break out.) Hæmorrhage, or afflux of blood. An order in the class pyrexiæ of Cullen's nosology is so called. It is characterized by pyrexia with a discharge of blood, without any external injury; the blood on venæsection exhibiting the buffy coat. The order hæmorrhagiæ contains the following genera of diseases, viz. epistaxis, hæmoptysis, phthisis, hæmorrhois, and menorrhagia.

HÆMORRHOIDAL ARTERIES. Arteriæ hæmorrhoidales. The arteries of the rectum: they are sometimes two, and at other times three in number. 1. The upper hæmorrhoidal artery, which is the great branch of the lower mesenteric continued into the pelvis. 2. The middle hæmorrhoidal, which sometimes comes off from the hypogastric artery, and very often from the pudical artery. It is sometimes wanting. 3. The lower or external hæmorrhoidal is almost always a branch of the pudical artery, or that artery which goes to the penis.

HÆMORRHOIDAL VEINS. Venæ hæmorrhoidales. These are two. 1. The external, which evacuates itself into the vena iliaca interna. 2. The internal, which conveys its blood into the vena portæ.

HÆMORRHOIS. (*hæmorrhois*, αιμοῤῥοις, from αιμα, blood, and ῥεω, to flow). *Aimorrhois*. The piles. A genus of disease in the class pyrexiæ and order hæmorrhagiæ of Cullen. They are varicose excrescences arising about the verge of the anus, or the inferior part of the intestinum rectum. The rectum, as well as the colon, is composed of several muscular membranes, connected to each other by an intervening cellular substance; and as the muscular fibres of this intestine always tend by their contraction to lessen its cavity, the internal membrane, which is very lax, forms itself into several rugæ or folds. In this construction nature respects the use of the part, which occasionally gives passage to, or allows the retention of, the excrements, the hardness and bulk of which might produce considerable lacerations, if this intestine were not capable of dilatation. The arteries and veins subservient to this part are called hæmorrhoidal,

and the blood that returns hence is carried to the meseraic veins. The intestinum rectum is particularly subject to the hæmorrhoids, from its situation, structure, and use; for whilst the course of the blood is assisted in almost all the other veins of the body by the distension of the adjacent muscles, and the pressure of the neighbouring parts, the blood in the hæmorrhoidal veins which is to ascend against the natural tendency of its own weight, is not only destitute of these assistances, but is impeded in its passage: for, first, the large excrements which lodge in this intestine dilate its sides, and the different resistances which they form there are so many impediments to the return of the blood; not in the large veins, for they are placed along the external surface of the intestine, but in all the capillaries which enter into its composition. Secondly, as often as these large excrements, protruded by others, approach near the anus, their successive pressure upon the internal coats of the intestine, which they dilate, drives back the blood into the veins, and so far tend to suspend its course; the necessary consequence of which is, a distension of the veins in proportion to the quantity of blood that fills them. Thirdly, in every effort we make, either in going to stool, or upon any other occasion, the contraction of the abdominal muscles, and the diaphragm pressing the contents of the abdomen downwards, and these pressing upon the parts contained in the pelvis, another obstruction is thereby opposed to the return of the blood, not only in the large veins, but also in the capillaries, which being of too weak a texture to resist the impulse of the blood, that always tends to dilate them, may thereby become varicose.

The dilatation of all these vessels is the *primary cause* of the hæmorrhoids; for the internal coat of the intestine, and the cellular membrane which connects that to the muscular coat, are enlarged in proportion to the distension of the vessels of which they are composed. This distension, not being equal in every part, produces separate tumours in the gut, or at the verge of the anus, which increases according as the venal blood is obstructed in them, or circulates there more slowly.

Whatever, then, is capable of retarding the course of the blood in the hæmorrhoidal veins may occasion this disease. Thus, persons that are generally costive, who are accustomed to sit long at stool, and strain hard; pregnant women, or such as have had difficult labours; and likewise persons who have an obstruction in their liver, are for the most part afflicted with the piles; yet every one has not the hæmorrhoids, the different causes which are mentioned above not being common to all, or at least not having in all the same effects. When the hæmorrhoids are once formed, they seldom disappear entirely, and we may judge of those within the rectum by those which, being at the verge of the anus, are plainly to be seen. A small pile, that has been painful for some days, may cease to be so, and dry up; but the skin does not afterwards retain its former firmness, being more lax and wrinkled, like the empty skin of a grape. If this external pile swell and sink again several times, we may perceive, after each return, the remains of each pile, though shrivelled and decayed, yet still left larger than before. The case is the same with those that are situated within the rectum; they may happen indeed never to return again, if the cause that produced them be removed; but it is probable that the excrements in passing out occasion a return of the swelling, to which the external ones are less liable: for the internal piles make a sort of knots or tumours in the intestine, which straightening the passage, the excrements in passing out occasion irritations there that are more or less painful in proportion to the efforts which the person makes in going to stool; and it is thus these tumours become gradually larger. The hæmorrhoids are subject to many variations; they may become inflamed from the above irritations to which they are exposed, and this inflammation cannot always be removed by art. In some, the inflammation terminates in an abscess, which arises in the middle of the tumour, and degenerates into a fistula. These piles are very painful till the abscess is formed. In others, the inflammation terminates by induration of the hæmorrhoid, which remains in a manner schirrus. These never lessen, but must necessarily grow larger. This schirrus sometimes ulcerates, and continually discharges a sanies, which the patient perceives by stains on his shirt, and by its occasioning a very troublesome itching about the verge of the anus. These kinds of hæmorrhoids sometimes turn cancerous. There are some hæmorrhoids, and those of different sizes, which are covered with so fine a skin as frequently to admit blood to pass through. This fine skin is only the internal coat of the rectum, greatly attenuated by the varicose distension of its vessels. The hæmorrhage may proceed from two causes, namely, either from an excoriation produced by the hardness of the excrements, or from the rupture of the tumefied vessels, which break by their too great distension. In some of these, the patient voids blood almost every time he goes to stool; in others not so constantly. We sometimes meet with men who have a periodical bleeding by the piles, not unlike the menses in women; and as this evacuation, if moderate, does not weaken the constitution, we may infer that it supplies some other evacuation which nature either ceases to carry on, or does not furnish in due quantity; and hence also we may explain why the suppression of this discharge, to which nature had been accustomed, is frequently attended with dangerous diseases. The hæmorrhoids are sometimes distended to such a degree as to fill the rectum, so that if the excrements are at all hard they cannot pass. In this case the excrements force the hæmorrhoids out of the anus to procure a free passage,

consequently the internal coat of the rectum, to which they are connected, yields to extension, and upon examining these patients immediately after having been at stool, a part of the internal coat of that gut is perceived forming a sort of ligature or stricture round the hæmorrhoids. A difficulty will occur in the return of these, in proportion to their size, and as the verge of the anus is more or less contracted. If the bleeding piles come out in the same manner upon going to stool, it is then they void most blood, because the verge of the anus forms a kind of ligature above them.

HÆRETICO COMBURENDO, a writ which anciently lay against an heretic, who, having once been convicted of heresy by his bishop, and having abjured it, afterwards falling into it again, or into some other, is thereupon committed to the secular power. See HERESY.

HAERLEM, or HARLEM, a populous city of the United Provinces, in Holland. In the year 1732, it contained 7963 houses, and about 40,000 inhabitants. The church, which is the largest in Holland, is adorned with a very fine organ. It consists of 8000 pipes, the largest 38 feet long, and 16 inches in diameter: it has 68 stops, of which the most curious is the *vox humana*. Haerlem is situated near a lake of the same name; and to the S. of the town is a wood, cut into delightful walks and vistas. At this city there are considerable manufactories of linen, tapes, and ribbands. Here is also a noted Philosophical Society. Lat. 52. 24 N. lon. 4. 38 E.

HÆRUCO. In zoology, a genus of the class vermes, order intestina. Body round, the fore part two-necked, and surrounded with a single row of prickles; without proboscis: one species only, with a greyish white and wrinkled body. Inhabits the intestines of the mouse; and is distinguished from the genus echinorhynchus by its wanting the retractile proboscis.

HAFT. *s.* (hæft, Saxon.) A handle; that part of any instrument that is taken into the hand (*Dryden*).

To HAFT. *v. a.* (from the noun.) To set in a haft.

HAG. *s.* (hægeþne, a goblin, Saxon.) 1. A fury; a she monster (*Crashaw*). 2. A witch; an enchantress (*Shakspeare*). 3. An ugly old woman (*Dryden*).

To HAG. *v. a.* (from the noun.) To torment; to harass with vain terrour (*Hudibras*).

HAG. HAG-FISH. In ichthyology. See GASTROBRANCHUS.

HAGARENS, the descendants of Ishmael. They are called also Ishmaelites and Saracens; and lastly, by the general name of Arabians. As to the Hagarens, they dwelt in Arabia the Happy, according to Pliny. In the Chronicles it is said (1 Chron. v. 10.) that the sons of Reuben, in the time of Saul, made war against the Hagarens, and became masters of their country eastward of the mountains of Gilead; which was the true and ancient country of the Hagarens.

HAGGAI (*pleasant*), the tenth of the minor prophets, and of those three prophets who were sent to the Jews after their return from the Babylonian captivity, was born at Babylon about A. M. 3457, and prophesied about 520 years before the Christian æra. The occasion of his prophecy was the stop which was put to the building of the Temple, during many years after the foundation of it had been laid. The people had applied themselves to the building of their own houses, and neglected the house of God; till moved at length by the earnest exhortations of the prophets they resumed the work, and completed it in a few years. The style of this prophet is for the most part plain and prosaic; interspersed, however, with several passages of much sublimity and pathos.

HA'GGARD. *a.* (*hagard*, French.) 1. Wild, untamed; irreclaimable (*Spenser*). 2. (*hager*, Ger.) Lean; rugged; ugly (*L'Est.*). 3. Deformed with passion (*Smith*).

HA'GGARD. *s.* 1. Any thing wild or irreclaimable (*Shakspeare*). 2. A species of hawk (*Sandys*).

HA'GGARDLY. *ad.* (from *haggard.*) Deformedly; uglily (*Dryden*).

HA'GGESS. *s.* (from *hog* or *hack.*) A mass of meat enclosed in a membrane.

HA'GGISH. *a.* (from *hag.*) of the nature of a hag; deformed; horrid (*Shakspeare*).

To HA'GGLE. *v. a.* (corrupted from *hackle* or *hack.*) To cut; to chop; to mangle (*Shakspeare*).

To HA'GGLE. *v. n.* To be tedious in a bargain; to be long in coming to the price.

HA'GGLER. *s.* (from *haggle.*) 1. One that cuts. 2. One that is tardy in bargaining.

HAGIOGRAPHA, a name given to part of the books in scripture, called by the Jews *Cetuvim*. The word is compounded of αγιος, "holy;" and γραφω, "I write." The name is very ancient: St. Jerom makes frequent mention of it: before him, St. Epiphanius called these books simply Γραφεια. The Jews divide the sacred writings into three classes: The Law, which comprehends the five books of Moses: the Prophets, which they call *Neviim*: and the *Cetuvim* כתובים, called by the Greeks, &c. *Hagiographa*: comprehending the book of Psalms, Proverbs, Job, Daniel, Ezra, including also the book of Nehemiah, Chronicles, Canticles, Ruth, the Lamentations, Ecclesiastes, and Esther. The Jews sometimes call these books the *Writings*, by way of eminence, as being written by immediate inspiration of the Holy Spirit. Thus says Kimchi, in his preface to the Psalms, Maimonides, in More Nevoch, and Elias Levita in his Thisbi, under the word כתב. They distinguish the *hagiographers*, however, from the Prophets; in that the authors of the former did not receive the matters contained in them by the way called *Prophecy*, which consists in dreams, visions, whispers, ecstasies,

&c. but by mere inspiration and direction of the Spirit.

HAGUE, a town of Holland, situated about half a league from the sea, heretofore the residence of the stadtholder, the states-general, and the states of the province. In the year 1768, it was supposed to contain 40,000 souls. It was little known till William II. king of the Romans, and comte of Holland, removed his court thither from Gravesande, in the year 1250: from which time it has always been the seat of government, and since the establishment of the republic, it might be reckoned the capital of the seven provinces. It stands in a dry soil, something higher than the rest of the country; the air is pure, and the environs delightful. The houses are good, and the streets large and long; several of them adorned with rows of trees. There are several squares, and many magnificent public buildings, the court, the prince's palace, the town-house, &c. In the prince's palace was a very valuable cabinet of natural history, coins, medals, &c. and excellent pictures in all. It is governed by its own magistrates, which are a baily, whose office is for life; three burgomasters, changed every year; seven echevins, and twelve common council; a pensioner, a secretary, and a treasurer: thirty-two miles S.W. Amsterdam, and twelve N.W. Rotterdam. Lat. 52. 4 N. Lon. 4. 23 E.

HAGUENAU, a town of France, and principal place of a district, in the department of the Lower Rhine, situated on the Motter, in the middle of a forest, which bears its name, fortified by Frederick the First, who made it an Imperial town, and called it *the Chamber of the Empire*, because in it were preserved the Imperial ornaments, under the house of Suabia. Here was a palace, in which the emperors sometimes resided, but, in consequence of the frequent wars, it is now almost destroyed. The number of inhabitants is about 3400. The surrounding land is sandy and unproductive, and the commerce is inconsiderable; the principal articles are madder and tobacco. Lat. 48. 47 N. Lon. 7. 53 E

HAGEUIA. In botany, a genus of the class octandria, order monogynia. Calyx two-leaved; corol five-petalled, flat; nectary five leaflets, four times as short as the petals; capsule: a tree of Abyssinia described by Mr. Bruce in his travels; leaves crowded at the top of the branches, interruptedly pinnate with an odd one; leaflets ovate-lanceolate, sharply serrate; panicle nodding, flexuous.

HAH. *interj.* An expression of sudden effort.

HA-HA, or AHA, a wall and sloping bank, serving as a fence about parks, pleasure-grounds, &c. The name is probably derived from the expression of surprise, *aha!* sometimes uttered on arriving at the declivity and finding a fence where none was expected.

HAIL, in natural history, a meteor generally defined frozen rain, but differing from it, in that the hailstones are not formed of single pieces of ice, but of many little spherules agglutinated together; neither are these spherules all of the same consistence; some of them being hard and solid, like perfect ice; others soft, and mostly like snow hardened by a severe frost. Hailstone has a kind of core of this soft matter; but more frequently the core is solid and hard, while the outside is formed of a softer matter. Hailstones assume various figures, being sometimes round, at other times pyramidal, crenated, angular, thin, and flat, and sometimes stellated with six radii, like the small crystals of snow. Their cause is probably electrical. Natural historians furnish us with various accounts of surprising showers of hail, in which the hailstones were of extraordinary magnitude. Of these we mention one or two, said to have happened in our own country.

"Dr. Halley, and others also, relate, that in Cheshire, Lancashire, &c. April 29th, 1697, a thick, black cloud, coming from Carnarvonshire, disposed the vapours to congeal in such a manner, that, for about the breadth of two miles, which was the limit of the cloud, in its progress for the space of sixty miles, it did inconceivable damage; not only killing all sorts of fowls and other small animals, but splitting trees, knocking down horses and men, and even ploughing up the earth; so that the hailstones buried themselves under ground an inch or an inch and a half deep. The hailstones, many of which weighed five ounces, and some half a pound, and being five or six inches about, were of various figures; some round, others half round; some smooth, others embossed and crenated; the icy substance of them was very transparent and hard, but there was a snowy kernel in the middle of them.

"In Hertfordshire, May 4, the same year, after a severe storm of thunder and lightning, a shower of hail succeeded, which far exceeded the former: some persons were killed by it, and their bodies beaten all black and blue; vast oaks were split, and fields of rye cut down as with a scythe. The stones measured from ten to thirteen or fourteen inches about. Their figures were various, some oval, others picked, and some flat." Phil. Trans. Number 229. See METEOROLOGY.

To HAIL. *v. n.* To pour down hail (*Isaiah*).

HAIL. *interj.* (hæl, health, Saxon) A term of salutation; health (*Milton*).

To HAIL. *v. n.* (from the noun.) To salute; to call to (*Dryden*).

HA'ILSHOT. *s.* (*hail* and *shot.*) Small shot scattered like hail (*Hayward*).

HA'ILSTONE. *s.* (*hail* and *stone.*) A particle or single ball of hail (*Shakspeare*).

HAILBRON, a free imperial town of Suabia, in the duchy of Wirtemburg. It is seated on the Neckar. Lat. 49. 9 N. Lon. 9. 15 E.

HAILING, in naval language, the salutation or accosting a ship at a distance, which is usually performed with a speaking-trumpet: the first exclamation is, "hoa, the ship, a

hoay," to which she replies "holloa;" then follow the requisite questions and replies.

HAILY. *a.* (from *hail.*) Consisting of hail

HAINAN, a considerable island of Asia, belonging to China, to the N. of the gulf of Cochin-China, and to the S. of the province of Canton, from which it is 12 miles distant. It is 400 miles in circumference. The soil of the N. part is level; but in the S. and E. are mountains, among which are valleys that produce two crops of rice every year. The inhabitants are mostly a wild sort of people, and great cowards, for 50 Chinese will put a thousand of them to flight. In general, they are a short and deformed people, and the colour of their skins is reddish.

HAINAULT, a province of the Netherlands; bounded on the N. by Brabant, on the N. W. by Flanders, on the W. by Artois, on the S. by Cambresis, Picardy, and Champagne, and on the E. by the territory of Liege, and the county of Namur. It is divided into Austrian Hainault, of which the capital is Mons; and French Hainault, which is included in the department of the North.

HAINAULT, a forest of Essex, lying to the S. E. of Epping Forest, and supposed to be so called from some of the deer, with which it was stocked, having been brought from the province of the same name in the Netherlands. In this forest is a celebrated oak, known through many centuries by the name of Fairlop. Beneath its shade, which overspreads an area of 300 feet in circuit, an annual fair has been long held on the 22d of July.

HAIR. *Pili. Capilli* The hairs of the human body are thin, elastic, dry filaments, arising from the skin. They consist of the *bulb*, situated under the skin, which is a vascular and nervous vesicle; and a *trunk*, which perforates the skin and cuticle, and is covered with a peculiar vagina. The colour of hair varies; its seat, however, is in the medullary juice. The hair, according to its situation, is differently named; thus, on the head it is called *capilli*; over the eyes, *supercilia*; *cilia*, on the margin of the eyelids; *vibrissæ*, in the foramina of the nostrils; *pili auriculares*, in the external auditory passage, *mystax*, on the upper lip; and *barba*, on the lower jaw.

As for the hair of the beard, the Romans for a long time wore it without shaving or cutting, and the time is not exactly known when they began to do it. Titus Livius seems to tell us, that this custom was in use from the year 369; for, speaking of Manlius Capitolinus who was taken prisoner, he relates that "the greatest part of the people being troubled at his imprisonment, changed their clothes, and let their beards and hair grow." If this were so, then we may infer that out of times of mourning they had their hair cut and their beards shaved.

Nevertheless Varro speaks clearly, that the first barbers came out of Sicily to Rome in the year 454, and that a man called Ticinius Menas brought them. From that time the young men began to have their beards cut, and hair, till they came to be 49 years old; but it was not allowed to be done above that age, says Pliny. Scipio Africanus had himself shaved all his days, and Augustus did the same in imitation of him.

The young men did not begin to shave themselves till they were twenty or twenty-one years of age, as did Nero and Caligula; but Augustus did not do it till he was twenty-five years old.

The day wherein they were shaved the first time was a day of rejoicing, and they were careful to put the hair of their beard into a silver or gold box, and make an offering of it to some god, particularly to Jupiter Capitolinus, as Nero did, according to the testimony of Suetonius.

Only the philosophers let their beards grow, and wore them very long, without cutting, or shaving.

HAIR as an ornament, or as an ensign of dignity or of religion. By the Jews hair was worn naturally long, just as it grew; but the priests had theirs cut every fortnight, while they were in waiting at the temple; they made use of no razors, however, but scissars only. The Nazarites, while their vow continued, were forbidden to touch their heads with a razor. See NAZARITE.

The falling of the hair, or a change of its colour, was regarded amongst the Hebrews as a sign of the leprosy. Black hair was esteemed by them as the most beautiful. Absalom's hair was cut once a year, and is said to have weighed 200 shekels, by the king's weight, which is about 31 ounces. The law of God hath left no particular ordinances with regard to the hair.

The hair of both Jewish and Grecian women engaged a principal share of their attention, and the Roman ladies seem to have been no less curious with respect to theirs. They generally wore it long, and dressed it in a variety of ways, ornamenting it with gold, silver, pearls, &c. On the contrary, the men amongst the Greeks and Romans, and amongst the later Jews, wore their hair short, as may be collected from books, medals, statues, &c. This formed a principal distinction in dress betwixt the sexes. This observation illustrates a passage in 1 Cor. xi. 14, 15. St. Paul forbids the Corinthian women, when praying by divine inspiration, to have their hair dishevelled; probably because this made them resemble the heathen priestesses, when actuated by the pretended influence of their gods.

It was esteemed a notable honour among the ancient Gauls to have long hair, and hence came the appellation *Gallia comata*. For this reason Julius Cæsar, upon subduing the Gauls, made them cut off their hair as a token of submission. It was with a view to this, that such as afterwards quitted the world to go and live in cloisters procured their hair to be shaven off; to show that they bid adieu to all earthly ornaments, and made a vow of perpetual subjection to their superiors.

The French historians and antiquaries have

been very exact in recording particulars of the hair of their several Kings: Charlemagne wore it very short, his son shorter; Charles the Bald had none at all. Under Hugh Capet it began to appear again; this the ecclesiastics took in dudgeon, and excommunicated all who let their hair grow. Peter Lombard expostulated the matter so warmly with Charles the Young, that he cut off his hair; and his successors for some generations wore it very short. A professor of Utrecht, in 1650, wrote expressly on the question, Whether it be lawful for men to wear long hair? and concluded for the negative. Another divine, named Reves, who had written for the affirmative, replied to him.

The ancient Britons were extremely proud of the length and beauty of their hair, and were at much pains in dressing and adorning their heads. Some of them carried their fondness for and admiration of their hair to an extravagant height. It is said to have been the last and most earnest request of a young warrior, who was taken prisoner and condemned to be beheaded, that no slave might be permitted to touch his hair, which was remarkably long and beautiful, and that it might not be stained with his blood. We hardly ever meet with a description of a fine woman or beautiful man, in the poems of Ossian, but their hair is mentioned as one of their greatest beauties. Not contented with the natural colour of their hair, which was commonly fair or yellow, they made use of certain washes to render it still brighter. One of these washes was a composition of lime, the ashes of certain vegetables, and tallow. They made use of various arts also to make the hair of their heads grow thick and long; which last was not only esteemed a great beauty, but was considered as a mark of dignity and noble birth. Boadicea queen of the Iceni is described by Dio with very long hair, flowing over her shoulders, and reaching down below the middle of her back. The Britons shaved all their beards, except their upper lips; the hair of which they, as well as the Gauls, allowed to grow to a very inconvenient length.

The Greeks and Romans often wore false hair.

Hair has not escaped the researches of modern chemistry; it has been examined by Hatchett, Berthollet, and others: from the analysis of it by Vauquelin it appears to be formed of nine different substances, viz.

1. An animal matter, which constitutes the greater part.
2. A white concrete oil in small quantity.
3. Another oil, of a darkish green colour, more abundant than the former.
4. Iron, the state of which in the hair is uncertain.
5. A fe d of manganese.
6. Phosphat of lime.
7. Very small quantity of carbonat of lime.
8. Silex in a conspicuous quantity.
9. A considerable quantity of sulphur. The hair from which these results were obtained was black; but it appears from similar experiments that red hair differs from black only in containing a red oil, instead of a dark-coloured one; and that white hair differs from both these only in the oil being nearly colourless, and in containing phosphat of magnesia, which the others do not. Carroty and flaxen hair will be occasioned by a red or yellow oil, which, when deepest, and mixed with a small quantity of brown oil, produces the dark red hair. And so for other colours and shades, which vary with the colour of the contained oil. To this oily matter Vauquelin properly attributes the suppleness, elasticity, and other properties of the hair, especially those which occasion it to burn so rapidly, and to form soap with alkalies. The animal matter first mentioned in the above enumeration appears to bear a very exact resemblance to that which physiologists have designated by the name of *mucus*.

Hair, in commerce, constitutes a very considerable article, especially since the fashion of wearing wigs has prevailed among all ranks, and has lately been extended to both sexes. The hair of this and other northern countries is preferred to that of the southern climates of Italy, France, &c. The chief quality of hair consists in its being *well fed*, as it is termed by hair-dressers, so that it be neither two coarse nor too slender. Hence thick hair is less susceptible of the artificial curl, and is disposed to frizzle; but, if it be too delicate, it will retain the curl only for a short time. The length of good hair is usually estimated at 25 inches; and, in proportion as it is shorter, it becomes less valuable. There appears to be no stated price for this article; as, according to its quality, it is sold at from 5s. to 5l. per ounce: it pays, when imported, a duty of 2s. 4½d. per lb.—With respect to the various operations which hair undergoes previously to being manufactured into wigs, we trust the reader will excuse our silence.

The hair of beavers, hares, and other animals, is used in various manufactures, especially that of hats, of which they constitute the principal material.

If the refuse of the short hair of hides be scattered on arable land, and left there to putrify, it proves one of the most fertilizing and durable manures.

Hair (Horse), likewise forms a considerable article of trade; it pays on importation a duty of about 11d. per lb. and is partly employed for weaving the covers of the seats of chairs, sofas, &c. but principally for the stuffing of bolsters and mattrasses. For the last mentioned purposes, the hair is previously baked, and, in that state, forms one of the most elastic couches, which is incomparably superior to the softest, but enervating, feather-beds.

Hair, in the manage, and among farriers, is popularly called the coat, and makes an object of principal consideration in respect of horses, &c.

If the hair of a horse, especially that about the neck, and parts uncovered, be sleek and

smooth, and close, it is an indication of his being in health, and good case: if rough and staring, or any way discoloured, it denotes a coldness, poverty, or some inward defect. To make the hair smooth, sleek, and soft, he must be kept warm, sweated often, and when sweated, the coat must be well scraped, and rubbed down.

Hair-cloths, in military affairs, are large pieces of cloth made with horse hair. They are used for covering the powder in waggons, or upon batteries; as also for covering charged bombs or hand grenades, and many other uses in magazines.

Hair-powder is generally prepared from starch, which, after being thoroughly dried, is ground and passed through the finest sieves. In its pure state, it should be perfectly white, and possess no smell. But in order to conceal base adulterations, or to please the votaries of the toilette, perfumers study the art of communicating to it various artificial odours from sweet-scented flowers, such as violets, jessamines, &c.

Dr. Darwin observes, that alum is sometimes used in the manufacture of hair-powder; and we understand from creditable persons, that even lime is frequently mixed with fine flour: it is therefore not surprising that so many persons who employ hair-dressers display bald heads, and are under the necessity of wearing wigs; but, if the latter were aware of the injury they inflict on themselves by inhaling such pernicious substances, in consequence of which many who exercise that trade pine away of pulmonary complaints, they would never use any other but genuine powder. And though common flour is not in itself pernicious, when used as a substitute for hair-powder, yet by the mucilage it contains the hair is apt to be caked together when the head is sensibly perspiring, or is accidentally wetted by a shower of rain; an effect which may be frequently noticed in a whole regiment of soldiers. Hair-powder pays, on importation, the prohibitory duty of 5*l.* 16*s.* 2½d. per cwt.

Those persons who cannot be dissuaded from the use of artificial means to strengthen hair injured by the above or other causes, may with safety employ a mixture consisting of equal parts of olive oil and spirits of rosemary, to which may be added a few drops of oil of nutmeg. If the hair be rubbed every night with a little of this liniment, and the proportion be very gradually increased, it will answer every purpose to be attained by those boasted preparations which are sold by empirics.

Hair-salt, in oryctology. See Alumen.

Hair-worm, in helminthology. See Gordius.

HA'IRBRAINED. *a.* (rather *harebrained.*) Wild, irregular (*Shakspeare*).

HA'IRBREADTH. *s.* A very small distance; the diameter of a hair (*Judges*).

HA'IRCLOTH. *s.* Stuff made of hair, very rough and prickly, worn sometimes in mortification (*Grew*).

HA'IRINESS. *s.* The state of being covered with hair, or abounding with hair.

HAIRLA'CE. *s.* The fillet with which the women tie up their hair (*Swift*).

HA'IRLESS. *a.* Wanting hair (*Shakspeare*).

HA'IRY. *a.* (from *hair.*) 1. Overgrown with hair (*Shakspeare*). 2. Consisting of hair (*Dryden*).

HAKE, in ichthyology. See Gadus and Blennius.

HAKLUYT (Richard), an English writer, born in Herefordshire, about 1553, and educated at Westminster school, from whence he was removed to Christ-church college, Oxford. He distinguished himself by his skill in cosmography, and published a curious collection of Voyages, in 3 vols. folio. He was in orders, and in 1605 was made a prebendary of Westminster, which, with the living of Wetheringset in Suffolk, was all the church preferment he ever obtained. He died in 1614. His faithful countrymen, out of respect to his labours, named a promontory, lying in 80 degrees of N. latitude, on the coast of Greenland, Hakluyt's headland. (*Watkins*).

HAL, in local names, is derived like *al* from the Saxon healle, i. e. a hall (*Gibson*).

HA'LBERDIER. *s.* One who is armed with a halberd.

HALBERSTADT, a handsome town of Germany, in the circle of Lower Saxony, and capital of a principality of the same name. It was formerly capital of the bishopric of Halberstadt, now secularized. The cathedral is a superb structure, with a fine peal of bells; and there are two regular abbeys within the town, and one without. There are also two nunneries. The Jews are tolerated here, and carry on a great trade. Lat. 52. 6 N. Lon. 11. 24 E.

HALBERT, or Halbard, in the art of war, a well-known weapon, carried by the sergeants of marching regiments. It is a sort of spear, the shaft of which is about five feet long, and made of ash or other wood. Its head is armed with a steel point, not unlike the point of a two-edged sword. But, besides this sharp point which is in a line with the shaft, there is a cross piece of steel, flat and pointed at both ends; but generally with a cutting edge at one extremity, and a bent sharp point at the other; so that it serves equally to cut down or to push withal. It is also useful in determining the ground between the ranks, and adjusting the files of a battalion. The word is formed of the German *hal*, hall, and *bard*, an hatchet. Vossius derives it from the German *hallebaert*, of *hel*, clarus, splendens, and *beart*, ax. The halbert was anciently a common weapon in the army, where there were companies of halberdiers.

Halbert-shaped, in botany. See Hastate.

HALCYON, a name given by the ancients to the alcedo, or kingfisher. See Alcedo.

Halcyon days, in antiquity, a name given to seven days before and as many after the

winter solstice; by reason the halcyon, invited by the calmness of the weather, laid its eggs in nests built in the rocks, close by the brink of the sea, at this season. Hence the term is now frequently used for days of peace and tranquillity; and the word halcyon is often used as an adjective, signifying placid, quiet, still, or peaceful.

HALDENSTEIN, a free and independent barony of the country of the Grisons. It consists of a small semicircular plain, which lies between the Rhine and the foot of Mount Calendar, about five miles in length, and scarcely one in breadth. It occupies also part of the mountain, which is so steep as not to be inhabited. It contains only two villages, Haldenstein and Sewils; and the whole number of the baron's subjects does not exceed 400.

HALE (Sir Mathew), an excellent English judge, was born at Aldersley in Gloucestershire, in 1600, and educated at Magdalen-hall, Oxford, from whence he removed to Lincoln's-inn, where he followed the study of the law with great application, and though he had been before of a gay turn, he now became as grave and religious. He was one of archbishop Laud's counsel, and acted in the same capacity to several other illustrious sufferers in the great rebellion, and even for the king himself. However he took the covenant and engagement, and accepted of a judge's place in the common-bench from Cromwell. On the death of Oliver, he refused to act under his son Richard, and even refused the mourning which was sent to him on the occasion. In the parliament which recalled the king, he sat as knight of the shire for his native county; and soon after the restoration, which he had greatly promoted, he was made chief baron of the exchequer, in which place he continued eleven years, and was then advanced to the chief justiceship of the king's-bench. In 1675 he resigned his office, and died a few months afterwards. His remains were interred in the church-yard of Aldersley. He was twice married, and had by his first wife ten children. Sir Matthew was a very learned man, a sound lawyer, an upright judge, and an exemplary christian. His writings are numerous on theological, philosophical, and legal subjects. The best known of his works are; 1. The primitive Origination of Mankind considered and explained according to the Light of Nature, &c. folio. 2. The History of the Pleas of the Crown, folio. 3. The original Institution, Power, and Jurisdiction of Parliaments. 4. Contemplations, Moral and Divine, three vols. 8vo. The inflexible integrity with which this great man acted as a judge, will be seen from the following. A noted peer went once to his chamber and told him, "That having a suit in law to be tried before him, he was then to acquaint him with it, that he might the better understand it when it should come to be tried in court." Upon which the lord chief baron interrupted him, and said, "He did not deal fairly to come to his chambers about such affairs; for he never received information of such causes but in open court, where both parties were to be heard alike." Upon which his grace (for it was a duke) went away not a little dissatisfied, and complained of it to the king as a rudeness that was not to be endured: but his majesty bid him content himself that he was used no worse; and said, "That he verily believed he would have used him no better if he had gone to solicit him in any of his own causes." Another remarkable incident happened in one of his circuits. A gentleman who had a trial at the assizes had sent him a buck for his table. When judge Hale therefore heard his name, he asked "if he was not the same person who had sent him the venison?" and finding that he was the same, told him, that "he could not suffer the trial to go on till he had paid him for his buck." The gentleman answered, that "he never sold his venison; and that he had done nothing to him which he did not do to every judge who had gone that circuit:" which was confirmed by several gentlemen present. The lord chief baron, however, would not suffer the trial to proceed till he had paid for the present: upon which the gentleman withdrew the record.

HALE. *a.* Healthy; sound; hearty (*Spens.*).

To HALE. *v. a.* (*halen*, Dutch.) To drag by force; to pull violently and rudely (*Brown*).

HA'LER. *s.* (from *hale.*) He who pulls and hales.

HALES (John), commonly called the "ever memorable," was born at Bath in 1584, and educated at Corpus Christi college, Oxford, from whence he removed to Merton on being elected to a fellowship. In 1613 he was admitted a fellow of Eton college, and in 1618 he attended sir Dudley Carleton, ambassador to Holland, as his chaplain. While there he was present at the synod of Dordt, an account of which he wrote to his patron in a series of letters, which are printed in his Remains. In 1638 archbishop Laud appointed him his chaplain, and procured for him a canonry of Windsor. He suffered great hardships in the great rebellion, and was almost reduced to the want of bread. He died in 1656. He was a man of great learning and skill in argument, as appears from his works, which have been several times printed.

HALES (Stephen), an eminent divine and philosopher, was born in Kent in 1677, and brought up at Benedict-college, Cambridge, where he was elected fellow in 1703. He took great pains in the study of botany and experimental philosophy, which by his means became fashionable pursuits at Cambridge. He also invented a machine for demonstrating the motions of the planets, which was nearly similar to what was afterwards called the orrery.

In March 1718, he was elected a fellow of the Royal Society, and soon after received the thanks of the society for his exertions in the cause of science: indeed he was one of the most active members that celebrated society ever had. In 1741 he published his invention of ventilators; which he afterwards greatly improved, and applied to many useful purposes.

In 1753, on the death of sir Hans Sloane, he was elected a member of the Academy of Sciences at Paris in his room. He was a man of a very modest and humble deportment; contenting himself with the rectory of Teddington, near Hampton-court; nor would he ever accept higher dignities when they were tendered to him. He was greatly esteemed by Frederic prince of Wales, and was almoner to the princess. He died in 1761. His communications to the Philosophical Transactions were numerous and valuable; besides these he published two volumes of Statical Essays.

HALE'SIA, in botany, a genus of the class dodecandria, order monogynia. Calyx four-toothed, superior corol; four-cleft; nut four-angled, two-seeded. Two species, indigenous herbs of Carolina.

HALES-OWEN, a town in Shropshire, inclosed by Worcestershire, six miles E. of Stourbridge. The poet Shenstone was born and buried here; and near it is the much admired seat of Lesowes, in the decoration of which his whole fortune was spent.

HALESWORTH, a town in Suffolk, with a market on Tuesdays. It has a trade in linen yarn and sailcloth; and about it much hemp is raised. Lat. 52. 25 N. Lon. 1. 40 E.

HALF. *s.* plural *halves* (healf, Saxon.) 1. A moiety; one part of two; an equal part (*Ben Jonson*). 2. It sometimes has a plural signification when a number is divided.

HALF. *ad.* In part; equally (*Dryden*).

HALF-BLOOD. *s.* One not born of the same father and mother (*Locke*).

HALF-BLOODED. *a.* Mean; degenerate (*Shakspeare*).

HALF-FACED. *a.* Showing only part of the face (*Shakspeare*).

HALF-HEARD. *a.* Imperfectly heard (*Pope*).

HALF-MOON. *s.* 1. The moon in its appearance when at half increase or decrease. 2. Any thing in the figure of a half-moon.

HALF-MOON, in fortification, an outwork composed of two faces, forming a saliant angle, whose gorge is in form of a crescent, or half-moon: whence the name.

HALF-PENNY. *s.* plural *half-pence*. A copper coin, of which two make a penny.

HALF-PIKE. *s.* The small pike carried by officers (*Tatler*).

HALF-SEAS OVER. A proverbial expression for any one far advanced. It is commonly used of one half-drunk (*Dryden*).

HALF-SPHERE. *s.* Hemisphere (*Ben Jonson*).

HALF-STRAINED. *a.* Half-bred; imperfect (*Dryden*).

HALF-SWORD. *s.* Close fight (*Shakspeare*).

HALF-WAY. *ad.* In the middle (*Granville*).

HALF-WIT. *s.* A blockhead; a foolish fellow (*Dryden*).

HA'LIBUT. *s.* A sort of fish. See

HALIBUT ISLAND, an island in the N. Pacific Ocean, so named by captain Cook in his last voyage, on account of the number of fish of that name they caught there, some of which weighed upward of a hundred pounds, and none less than twenty. It is seven leagues in circumference, and very low and barren. Lat. 54. 48 N. Lon. 164. 15 W.

HALICARNASSUS, in ancient geography, a principal town of Caria, said to be built by the Argives, and situated between two bays, the Ceramicus and Jasius. It was the royal residence (called Zephyra formerly), especially of Mausolus, made more illustrious by his monument.

HALICACABUS. (αλικακαβος, from αλς, the sea, and κακαβος, night-shade; so called because it grows upon the banks of the sea.) See ALKEKENGI.

HALIÆTUS, in ornithology. See FALCO.

HALIFAX, a town of Nova Scotia, in North America, on Chebucto Bay. It has a good harbour, large and safe enough to shelter a squadron of ships throughout the winter. The town has an entrenchment, and is strengthened with forts of timber. Lat. 44. 45 N. Lon. 63. 30 W.

HALIFAX, a handsome town in the west riding of Yorkshire, with a market on Saturday. It is finely seated in a hilly country, of rather difficult access, but full of people. It is the great market for stuffs, such as shalloons, calamancos, everlastings, &c. It has a large market-house, called the New Piece Hall, as well as various others for particular goods. It is a very large parish, and contains twelve chapels of ease, 1973 houses, and 8886 inhabitants. Lat. 53. 45 N. Lon. 1. 45 W.

HA'LIMASS. *s.* (halig and *mass*.) The feast of All-Saints (*Shakspeare*).

HALIOTIS. Sea ear. In zoology, a genus of the class vermes, order testacea. Animal a limax: shell univalve, dilated, ear-shaped, with a longitudinal row of orifices along the surface: spire lateral and nearly concealed. Nineteen species; scattered through the seas of the different quarters of the globe. The following are the chief.

1. H. mida. Midas ear. Shell roundish; both sides polished: thick within rich pearl-colour; the outside with longitudinal undulate wrinkles, dirty green, and generally covered with marine substances. From eight to ten orifices. Inhabits the Indian Ocean and around the Cape; from seven to nine inches long.

2. H. asinum. Asses ear. Shell smoothish, oblong, with a somewhat falcated margin, and elevated nerves on the outside, varied with green and brown; the inside green nacreous; orifices elevated about thirty, of which from five to seven are open: all the striæ are granulate near the spire, and often dotted with red. Inhabits India: hardly three inches long.

3. H. tuberculata. Shell subovate, the outside transversely grooved, rugged, and tuberculate. Found on our own coasts; inhabits most seas: from four to five inches long.

4. H. iris. Shell ventricose, fulvid-brown, with transverse wrinkles and longitudinal tube-

rose plaits: the under-side shining with changeable iridescent colours: four and a half inches long. Inhabits New Zealand: extremely rare and valuable.

HA'LITUOUS. *a.* (*halitus*, Lat.) Vaporous; fumous (*Boyle*).

HA'LITUS, in physiology, breath, aura, vapour, or gass. See GASS.

HALITZ, a town of Poland, in Red Russia, with a castle. Since 1773 it has belonged to the emperor, and is included in the new kingdom of Galicia. Lat. 49. 20 N. Lon. 25. 19 E.

HALL, in architecture, a large room at the entrance of a fine house and palace. Vitruvius mentions three kinds of halls; the tetrastyle, with four columns supporting the platfond or ceiling; the Corinthian, with columns all round let into the wall, and vaulted over; and the Egyptian, which had a peristyle of insulated Corinthian columns, bearing a second order with a ceiling. The hall is properly the finest as well as first member of an apartment: and in the houses of ministers of state, magistrates, &c. is the place where they despatch business, and give audience. In very magnificent buildings, where the hall is larger and loftier than ordinary, and placed in the middle of the house, it is called a saloon.

HALL is also particularly used for a court of justice; or an edifice wherein there is one or more tribunals. In Westminster-hall are held the great courts of England, viz. the king's-bench, chancery, common-pleas, and exchequer. In adjoining apartments is likewise held the high court of parliament. Westminster-hall was the royal palace or place of residence of our ancient kings; who ordinarily held their parliaments and courts of judicature in their dwelling-houses (as is still done by the kings of Spain), and frequently sat in person in the courts of judicature, as they still do in parliament. This hall is reckoned superior in dimensions to any in Europe; being 300 feet long, and 100 broad.

HALL (Joseph), a celebrated English prelate, was born in 1574, at Ashby-de-la Zouch in Leicestershire, and educated at Emanuel-college, Cambridge, where he obtained a fellowship. In 1597 he published his Virgidemiarum, or Satires, in six books, which were reprinted in Oxford in 1753. About 1603 he was presented to the rectory of Halstead in Suffolk, which he resigned on obtaining Waltham Holy-Cross in Essex. Through the friendship of lord Denny he was made chaplain to Henry prince of Wales, who had a great regard for him. In 1616 he obtained the deanery of Worcester, and two years after he was appointed one of the divines at the synod of Dordt, from which, however, he was obliged to return on account of illness. In 1627 he was promoted to the bishopric of Exeter, from whence in 1641 he was translated to Norwich. This pious and moderate prelate was sadly used by the puritanical party at the commencement of the civil war; and in 1647 he retired to a small estate which he had near Norwich, and died there in 1656. Being an enemy to burying in churches, he directed that his body should be interred in the church-yard. His works have been collected into three volumes folio. They abound in fine thoughts, expressed in excellent language. His Meditations on the Histories of the Old and New Testament have been modernized by Mr. Glasse of Hanwell, and published in four volumes 12mo.

HALLAGE, a fee or toll paid for cloth brought to be sold in Blackwell-hall, London.

HALLAMAS, the day of All-Hallows, or All-Saints, viz. November 1.

HALLAND, a province of Gothland, in Sweden, on the W. coast of that kingdom. It is 60 miles along the coast, but not above 12 in breadth. Halmstadt is the capital.

HALLATON, a town of Leicestershire, with a market on Thursdays. Lat. 52. 32 N. Lon. 0. 50 E.

HALLE, a dismantled town of Hainault, in the Austrian Netherlands. Lat. 50. 46 N. Lon. 4. 20 E.

HALLE, a considerable town of Magdeburg, in Upper Saxony. It is the seat of an university. Lat. 51. 36 N. Lon. 12. 8 E.

HALLE, a town of Suabia, in Germany. Lat. 49. 20 N. Lon. 9. 52 E.

HALLE, a town of Germany, in Tyrol. Lat. 47. 12 N. Lon. 11. 33 E.

HALLEIN, a town of Germany, in the archbishopric of Saltzburg; seated on the river Saltza, among the mountains, wherein are mines of salt, which are the chief riches of the town and country. Lat. 47. 33 N. Lon. 13. 12 E.

HALLELUJAH, a term of rejoicing, sometimes sung, or rehearsed, at the end of verses. The word is formed of two Hebrew words joined together: one of them הללו, *hallelu*, and the other יה *jah*; an abridgment of the name of God, יהוה *Jehovah*. The first signifies *laudate, praise ye*; and the other *Dominum*, the Lord.

St. Austin says, that in some churches it was sung only on Easter-day, and the fifty days of Pentecost; but that it was never used during the time of Lent. St. Jerome informs us in his epitaph of Fabiola, that it was commonly sung at funerals, and speaks of the whole multitude joining in the hallelujah, and making the golden roof of the church shake with the peal of the chorus.

HALLER (Albert Van), a celebrated physician and poet, was born at Berne in Switzerland, and obtained the professorship of medicine at Gottingen. He greatly improved the medical science: his Elementa Physiologiæ, and Bibliotheca Medicinæ, will afford to the latest posterity undeniable proofs of his indefatigable industry, penetrating genius, and solid judgment. He also wrote elegantly as a moralist, and as a poet: and he was not more eminent for his literary attainments than for his piety to God, and his benevolence to his fellow-creatures. He died in 1777, aged 75 years.

HALLERIA. Fly honey-suckle. In bo-

tany, a genus of the class didynamia, order angiospermia. Calyx three or four-leaved; corol four-cleft; berry superior, two-celled, many-seeded. Two species; natives of the Cape; one of them with a woody stem, ever-green leaves, solitary red flowers: the other herbaceous.

HALLEY (Edmund), a famous English astronomer, was born in London in 1656, and educated at St. Paul's school, from whence he was sent to Queen's-college, Oxford, where he chiefly applied himself to the mathematics, particularly astronomy. He made a great number of accurate observations, and having formed the design of completing the scheme of the heavens by the addition of the stars near the south pole, he went to St. Helena in 1676, and completed his catalogue, which at his return he presented to king Charles II. who gave him a mandamus to the university of Oxford for the degree of M.A. At the same time he was chosen a fellow of the Royal Society. In 1679 he went to Dantzic to confer with Hevelius about the dispute between him and Dr. Hooke, respecting the preference of plain or glass sights in astronomical instruments. In 1680 appeared the great comet which Mr. Halley first observed in his passage from Dover to Calais. He afterwards completed his observations upon it at the Royal Observatory at Paris. From thence he went to Italy with his old schoolfellow, the famous Mr. Robert Nelson, and in 1681 he returned to England. He still continued his favourite pursuit, and so highly were his abilities appreciated, that Mr. Newton committed to his care, in 1686, the publication of his immortal Principia, to which Mr. Halley prefixed a copy of verses in Latin. In 1698 he was appointed captain of a ship, sent out by king William for the express purpose of establishing the theory of the variation of the compass, which our author had advanced in 1683. He made another voyage on the same design the following year, and returned to England in September, 1700, and from his observations in these voyages he was enabled to publish his General Chart, shewing at one view the variation of the compass in all those seas where the English navigators were acquainted. He was sent out again on a third voyage to ascertain the course of the tides in every part of the British Channel, of which, in 1702, he published a large chart. Soon after he went, at the request of the emperor of Germany, to view the Adriatic seas, for the purpose of examining two ports which the emperor intended erecting there. He returned in 1703, and had the degree of LL.D. conferred on him by the university of Oxford. He was also appointed professor of geometry, and had a captain's half pay settled on him. In 1713 he was chosen secretary to the Royal Society, and in 1719 appointed astronomer-royal. He died in 1742. Dr. Halley published several papers in the Philosophical Transactions, a set of Astronomical Tables, and an edition of Apollonius's Works in folio, in 1710.

Although the doctor was in his sixty-fourth year when he entered upon his office at Greenwich, yet he enjoyed such a course of uninterrupted health and strength, that he was enabled to watch the heavens with the closest attention for eighteen years, hardly ever missing an observation all that time, but, without any assistant, performing the whole business of the observatory himself. During this period he made a more complete series of observations upon the moon during a whole revolution of the line of her nodes, than had ever before been obtained; which happily led to the perfecting and establishing Newton's theory of the motion of that body. Indeed Dr. Halley's exertions in the service of astronomy have all been of the most important nature, and will cause his name to be remembered with gratitude and respect, so long as that sublime science continues to be admired and cultivated.

HALLEY'S QUADRANT. See QUADRANT.

HA'LLIA, in botany, a genus of the class diadelphia, decandria. Calyx five-parted, regular; legume one-seeded, two-valved. Eight species; all natives of India or the Cape, generally with yellow or violet flowers.

HALLIARDS, the ropes or tackles usually employed to hoist or lower any sail upon its respective mast or stay. See JEARS.

HA'LLOO. *interj.* (*allons*, let us go! Fr.) A word of encouragement when dogs are let loose on the game (*Dryden*)

To HA'LLOO. *v. n.* (*haler*, French.) 1. To cry as after the dogs (*Shakspeare*). 2. To treat as in contempt (*Sidney*).

To HA'LLOO. *v. a.* 1. To encourage with shouts (*Prior*). 2. To chase with shouts (*Shakspeare*). 3. To call or shout to (*Shakspeare*).

To HA'LLOW. *v. a.* (halȝian, haliȝ, Sax.) 1. To consecrate; to make holy (*Hooker*) 2. To reverence as holy: as *hallowed* be thy name.

HALLUCINATION. *s.* (*hallucinatio*, Lat.) Errour; blunder; mistake; folly; depraved imagination (*Addison*).

HALM. *s.* (healm, Saxon.) Straw.

HALMOTE, or HALIMOTE, is the same with what we now call a court-baron, the word implying a meeting of the tenants of the same hall or manor. The name is still retained at Luston, and other places in Herefordshire.

HALMSTADT, a strong seaport of Sweden, capital of Halland. Lat. 56. 39 N. Lon. 12. 48 E.

HALO, in physiology, a meteor in form of a luminous ring or circle, of various colours, appearing round the bodies of the sun, moon, planets, or fixed stars. The word is formed of the Greek ἅλως, or ἅλων, area. That round the moon is the most usual, and is also called *corona*, or crown.

The most considerable and generally received theory relating to the generation of Halos is that of Mr. Huygens. This celebrated author supposes Halos, or circles round the sun, to be formed by small round grains of hail, composed of two different parts, the one of which is

transparent, inclosing the other, which is opaque; which is the general structure actually observed in hail. He farther supposes, that the grains or globules, that form these Halos, consisted at first of soft snow, and that they have been rounded by a continual agitation in the air, and thawed on their outside by the heat of the sun, &c. And he illustrates his ideas of their formation by geometrical figures.

Mr. Weidler endeavours to refute Huygens's manner of accounting for Halos, by a vast number of small vapours, each with a snowy nucleus, coated round with a transparent covering. He says, that when the sun paints its image in the atmosphere, and by the force of its rays puts the vapours in motion, and drives them toward the surface, till they are collected in such a quantity, and at such a distance from the sun on each side, that its rays are twice refracted, and twice reflected; when they reach the eye they exhibit the appearance of a Halo, adorned with the colours of the rainbow; which may happen in globular pellucid vapours without snowy nuclei, as appears by the experiment of hollow glass spheres filled with water: therefore, whenever those spherical vapours are situated as before-mentioned, the refractions and reflections will happen every where alike, and the figure of a circular crown, with the usual order of colours, will be the consequence. Philos. Trans. Number 458.

Newton's theory of Halos may be seen in his Optics, p. 155. And this curious theory was confirmed by actual observation in June 1692, when the author saw by reflection, in a vessel of stagnated water, three Halos, crowns, or rings of colours, about the sun, like three little rainbows concentric to his body. These crowns inclosed one another immediately, so that their colours proceeded in this continual order from the sun outward: blue, white, red; purple, blue, green, pale yellow, and red; pale blue, pale red. The like crowns sometimes appear about the moon. The more equal the globules of water or ice are to one another, the more crowns of colours will appear, and the colours will be the more lively. Optics, p. 288.

There are several ways of exhibiting phænomena similar to these. The flame of a candle, placed in the midst of a steam in cold weather, or placed at the distance of some feet from a glass window that has been breathed upon, while the spectator is also at the distance of some feet from another part of the window, or placed behind a glass receiver, when air is admitted into the vacuum within it to a certain density, in each of these circumstances it will appear to be encompassed by a coloured Halo. Also, a quantity of water being thrown up against the sun, as it breaks and disperses into drops, forms a kind of Halo or iris, exhibiting the colours of the natural rainbow. Musschenbroek observed, that when the glass windows of his room were covered with a thin plate of ice on the inside, the moon seen through it was surrounded with a large and variously coloured Halo; which, upon opening the window, he found arose entirely from that thin plate of ice, because none was seen except through this plate. Musschenbroek concludes his account of coronas with observing, that some density of vapour, or some thickness of the plates of ice, divides the light in its transmission either through the small globules or their interstices, into its separate colours; but what that density is, or what the size of the particles which compose the vapour, he does not pretend to determine. Introd. ad Phil. Nat. p. 1037.

It has often been observed that a Halo about the sun or moon does not appear circular and concentric to the luminary, but oval and excentric, with its longest diameter perpendicular to the horizon, and extended from the moon farther downward than upward. Dr. Smith ascribes this phenomenon to the apparent concave of the sky being less than a hemisphere. When the angle which the diameter of a Halo subtends at the eye is 45° or 46°, and the bottom of the Halo is near the horizon, and consequently its apparent figure is most oval, the apparent vertical diameter is divided by the moon in the proportion of about 2 to 3 or 4, and is to the horizontal diameter drawn through the moon, as 4 to 3, nearly. See farther on the subject of this article, Priestley's Hist. of Discoveries relating to Vision, p. 596—613; and Smith's Optics, art. 167, 513, 526, 527, &c.

Halo. (*halo*, αλων.) In anatomy, the red circle surrounding the nipple, which becomes somewhat brown in old people, and is beset with many sebaceous glands.

HALORA'GIS, in botany, a genus of the class octandria, order tetragynia. Calyx four-leaved, superior; petals four; drupe dry, inclosing a four-celled nut. One species: an undershrub of New Zealand, branched, with square stem; rough, opposite, ovate-lanceolate leaves; and triple axillary flowers at the ends of the branches.

HA'LSENING. *a.* (*hals*, Germ.) Sounding harshly: not in use (*Carew*).

HA'LSER. *s.* (from halſ, neck, and ſeel, a rope.) A rope less than a cable.

HALSTEAD, a town of Essex, with a market on Friday, and a manufactory of bays and says. Lat. 51. 59. N. Lon. 0. 45 E.

To HALT. *v. n.* (healt, Saxon, lame.) 1. To limp; to be lame (*Dryden*). 2. To stop in a march (*Addison*). 3. To hesitate; to stand dubious (*Kings*). 4. To fail; to faulter (*Shakspeare*).

Halt. *a.* (from the verb.) Lame; crippled.

Halt. *s.* (from the verb.) 1. The act of limping; the manner of limping. 2. (*alte*, Fr.) A stop in a march (*Milton*).

HA'LTER. *s.* (from *halt.*) He who limps.

Halter, in the manage, a headstall, by which a horse is fastened to the manger when confined in a stable. Halters are of two kinds; the one prepared of cord, the other of leather, with throat-straps and buckles, nose-band, &c. which last are called double-reined hunting-collars. These are the safest in every respect, and although the most expensive at first,

cheapest in the end. Hempen halters are sometimes injurious, in forming swellings, or lacerations, upon the upper part of the head, behind the ears, by the friction of the hard-twisted cord upon a part naturally tender and susceptible. They are, however, now but very little used, except in the stables of inferior inns, and lower farm-houses.

HALTER-CAST, in the manage, an accident to which horses are constantly liable; but which generally proceeds from the inadvertency of leaving the rein of the halter of too great a length on one side or the other.

It implies an entanglement of the halter about the horse's pastern, in consequence of his endeavouring to rub his neck with his hinder foot, during his struggles to extricate himself from which struggles, the heel is sometimes so terribly excoriated, as to produce not only a wound of much trouble, but often to leave a vexatious blemish, never to be removed.

To HA'LTER. *v. a.* (from the noun.) To bind with a cord (*Atterbury*).

HALTERISTÆ, in antiquity, a kind of players at discus; denominated from a peculiar kind of discus called by the Greeks αλτηρ, and by the Latins *halter*. See DISCUS.

The halter was of a cylindrical figure, smaller in the middle (where it was held) by one diameter, than at the two ends. It was about a foot long, and there was one for each hand: it was made either of iron, stone, or lead.

HALTON, or HAULTON, i. e. *High-Town*, a town of Cheshire, 186 miles from London. It stands on a hill, where a castle was built anno 1071, and is a member of the duchy of Lancaster; which maintains a large jurisdiction in the county round it, by the name of Halton-Fee, or the honour of Halton, having a court of record, prison, &c. within themselves. About Michaelmas every year, the king's officers of the duchy keep a law-day at the castle, which still remains a stately building; once a fortnight a court is kept here, to determine all matters within their jurisdiction; but felons and thieves are carried to the sessions at Chester, to receive their sentence. Lat. 53. 23 N. Lon. 2. 47 W.

HALVED HEAD. In botany. Dimidiatum capitulum. Hemispherical, or resembling half a head: round on one side and flat on the other. A halved spathe: investing the fructification on one side only. A halved involucre: placed wholly on one side: as in Æthusa.

To HALVE. *v. a.* (from *half, halves.*) To divide into two parts.

HALVES. *interj.* (from *half.*) An expression by which any one lays claim to an equal share.

HALYS, in ancient geography, the noblest river of the Hither Asia, through which it had a long course, was the boundary of Crœsus's kingdom to the east. Running down from the foot of mount Taurus, through Cataonia and Cappadocia, it divided almost the whole of the Lower Asia, from the sea of Cyprus down to the Euxine, according to Herodotus; who seems to extend its course too far. According to Strabo, himself a Cappadocian, it had its springs in the Great Cappadocia.

HAM, a Saxon word used for *a place of dwelling*; a village or town: hence the termination of some of our towns, Nottingham, Buckingham, &c. Also a home close, or little narrow meadow, is called a *ham*.

HAM, is also a part of the leg of an animal; being the inner or hind part of the knee, or the ply or angle in which the leg and thigh, when bent, incline to each other. See HOCK and HOUGH.

HAM, in commerce, the thigh of a hog or bear, dried, seasoned and prepared, so as to preserve it in a state possessing a pungent and agreeable flavour.

Hams may be cured, in order to resemble in taste those of Westphalia, by the following process: Cover a young ham of pork with dry salt, let it lie for 24 hours to drain off the blood, then wipe it perfectly dry, and take one pound of brown sugar, a quarter of a pound of saltpetre, half a pint of bay salt, and three pints of common salt; incorporate these ingredients in an iron pan over the fire, and stir them continually till they acquire a moderate degree of heat. In this pickle the ham must be suffered to remain for three weeks, frequently turning it, when it should be suspended in a chimney for drying, by means of smoke from no other but a wood-fire.

Smoked hams (says Dr. Willich) are a very strong food, which is not easily digested. If eaten in proper time, and in small quantities, they may be a cordial to some vigorous stomachs, especially in the morning, as a substitute for the pernicious hot and buttered rolls; but boiling renders their digestion still more difficult. See SMOKING.

Ham pays on importation a duty of 2l. 11s. 8½d. per. cwt.

HAM, a strong town of Westphalia, capital of the county of Marck. It is seated on the Lippe, and is a place of considerable trade. Lat. 51. 36 N. Lon. 7. 50 E.

HAM, a town of France, in the department of Somme, with a strong castle. Lat. 49. 45 N. Lon. 3. 6 E.

HAM (West), a village of Essex, where are the remains of an opulent abbey, founded in 1135. This village is seated on the river Lea, about four miles E. by N. of London.

HAM (East), a village in Essex, adjoining to West Ham.

HAMAH, a town of Asiatic Turkey, in Syria, on the Orontes. It is the residence of the scheik, with the title of emir. The geographer, Abulfeda, was prince of Hamah from the year 1342 to 1345. Numbers of wild asses are found in the country between this place and Aleppo: 124 miles N. of Damascus, and sixty-eight S.S.W. Aleppo.

HAMAMELIS. Witch-hazel. In botany, a genus of the class tetrandria, order digynia. Involucre three-leaved; proper calyx four-leaved; petals four; nut two-horned; two-

celled. One species: a Virginian shrub, with oval, indented, alternate leaves.

HAMA'TED. *a.* (*hamatus*, Latin.) Hooked; set with hooks.

HAMAXOBII, HAMAXOBIANS, in the ancient geography, a people who had no houses, but lived in carriages. The word is formed from αμαξα, a *carriage* or *chariot*, and βιος, *life*. The Hamaxobii were an ancient people of Sarmatia Europæa, inhabiting the southern part of Muscovy.

HAMBACH, a town of Westphalia, in the duchy of Juliers. Lat. 50. 54 N. Lon. 6. 28 E.

To HA'MBLE. *v. a.* (from *ham.*) To cut the sinews of the thigh; to hamstring.

HAMBURGH, one of the largest towns in Germany, consisting of the Old Town and the New Town; both nearly of an equal size. Most of the houses are built after the manner of the Dutch, and richly furnished within. The principal streets of the Old Town have long and broad canals, which are filled twice every 24 hours by the tide. These are not only useful for trade, but serve to keep the houses and the streets clean. It is seated on the river Elbe, which is of vast advantage to the inhabitants; and on the side of Holstein is the Alster, which, before it enters the town by sluices, forms a fine basin that cannot be equalled in Germany. Hamburgh is well fortified, and on the ramparts are handsome walks. The burghers mount guard themselves, and are divided into several companies. The streets are well lighted every night; and there is a guard which patroles all over the city. The senate of this town is composed of four burgomasters, of whom one only is a tradesman; four syndics; twenty-four senators, of whom eleven are men of letters, and the rest tradesmen; four secretaries, one of whom is a prothonotary, and another belongs to the archives; so that the whole senate consists of thirty-six persons. The town is divided into five parishes; and out of each are formed several colleges, or companies who take care of public affairs, unless there is any thing too high for their determination, and then it is judged by a sort of general assembly. Hamburgh, from its situation, has all possible advantages for foreign and domestic trade; particularly from its communication by the Elbe, with some of the principal navigable rivers in Germany. There are generally not less than 200 ships at a time belonging to foreign merchants before the city, and there is a handsome exchange. The inhabitants are chiefly Lutherans, and none but the English have the liberty of performing divine service in a chapel of their own. Other religions are tolerated at Altena, a large town near the harbour of Hamburgh: except the Jews, who have no synagogue. Beside the five principal churches, they have 11 smaller ones for particular occasions, some of which belong to hospitals. The cathedral of Our Lady is a very fine structure, and has a chapter consisting of 14 canons, who are all Protestants. Lat. 53. 34 N. Lon. 9. 55 E.

HAME, *s.* (hama, Saxon.) The collar by which a horse draws in a waggon.

HAMEL (John Baptiste du), a very learned French philosopher and writer in the 17th century. At 18 he wrote a treatise, in which he explained in a very simple manner Theodosius's three books of Spherics; to which he added a Tract upon Trigonometry, extremely perspicuous, and designed as an introduction to astronomy. Natural philosophy, as it was then taught, was only a collection of vague, knotty, and barren questions; when our author undertook to establish it upon right principles, and published his Astronomia Physica. In 1666 Mr. Colbert proposed to Louis XIV. a scheme, which was approved of by his majesty, for establishing a royal academy of sciences; and appointed our author secretary of it. He published a great many books; and died at Paris in 1706, of mere old age, being almost 83. He was regius professor of philosophy, in which office he was succeeded by M. Varignon. He wrote Latin with purity and elegance.

HAMELIN, a strong town of Germany, in the duchy of Calenburgh, situate at the confluence of the Hamel and Weser. Lat. 52. 6 N. Lon. 9. 36 E.

HAMELLIA. In botany, a genus of the class pentandria, order monogynia. Corol five-cleft; berry five celled; inferior many-seeded. Five species: natives of the West Indies or South America. Of these, however, the flowers of H. sessiflora are not thoroughly known; whence its genus is in some measure doubtful. Generally trees or shrubs; one species, however, H. axillaris, subherbaceous. The wood of H. ventricosa, with terminal and axillary racemes; campanulate swelling corols; and triplet leaves, is of a fine soft grain, and is called by the cabinet-makers Spanish elm or prince-wood.

HAMESOCKEN, the name in the ancient English law for burglary, or nocturnal house-breaking.

HA-MI, a country situate to the N.E. of China. Though surrounded by deserts, it is accounted one of the most delightful countries in the world. Its rice and fruits, particularly the melons and dried raisins, are in high esteem in China. It is a kingdom tributary to that country, and its capital is of the same name. Lat. 42. 55 N. Lon. 93. 44 E.

HAMILCAR. See AMILCAR.

HAMILTON, a town in Lanerkshire, with the ruins of a collegiate church, founded in 1451. It is situate on the Clyde. Lat. 55. 58 N. Lon. 4. 16 W.

HAMILTON (Dr. Hugh), a very respectable divine, mathematician, and philosopher, was born at Knock, in the county of Dublin, March 26, 1729. He entered Trinity college, Dublin, in November 1742; and obtained a fellowship in that college in 1751, when he was only 22 years of age. In the year 1758 he published his well known and much admired Treatise on Conic Sections; and the next year was elected Erasmus Smith's pro-

fessor of natural philosophy. In the discharge of his duty as professor, he composed and published four lectures introductory to the study of natural philosophy; and in the year 1762 he wrote three philosophical essays, on the ascent of vapours, the formation of clouds, rain, &c.; on the nature of the aurora borealis, and the tails of comets; and on the principles of mechanics. Dr. Hamilton resigned his fellowship in 1764, having accepted the living of Kilmacrenan, in the gift of the college: in 1767 he was collated to the parish of St. Anne's, Dublin. This latter preferment was soon exchanged for the deanery of Armagh. In 1772 he married: and soon after published his essay on the existence and attributes of the Supreme Being. He also partly prepared an essay on the permission of evil. In the year 1792 he made some important improvements in the construction of the barometer; and in 1794 drew up a paper on the power of fixed caustic alkaline salts to preserve the flesh of animals from putrefaction. All this time he attended sedulously and conscientiously to his duties as a parish priest. In January 1796, he was consecrated bishop of Clonfert; and about three years afterwards he was translated to the see of Ossory, of which he continued bishop nearly seven years. He died Dec. 1st, 1805, in the 77th year of his age.

The principal trait in the disposition of bishop Hamilton was unaffected humility: his chief intellectual characteristic, a patient manner of thinking. His theory of the solution of water in air is now exploded, and his theory of the aurora borealis has yielded to that of M. Libes. (See AURORA BOREALIS, and EVAPORATION.) But his mechanical essays, though containing one or two slight mistakes, may still be read with pleasure and advantage. In his essay on the existence and attributes of God, he preserves a uniformity of argument, deducing both the physical and moral attributes from the principle of necessity; whereas Dr. Clarke, after proving the physical attributes synthetically or *a priori*, when he comes to prove the moral (as intelligence) quits his first process and uses that *a posteriori*. Dr. Hamilton's works have been lately collected and published by his son Alexander Hamilton, in 2 vols. 8vo.; of which the first contains the Latin edition of the Conic Sections; we should have been more pleased, had he given these in English from the edition of 1773, as the two volumes would then have been uniformly in one language throughout.

HAMLET, HAMEL, or HAMPSEL, (from the Saxon *ham*, i. e. *domus*; and the German *let*, i. e. *membrum*), signifies a little village, or part of a village or parish; of which three words the first is now only used, though Kitchen mentions the two last. By Spelman there is a difference between *villam integram*, *villam dimidiam*, and *hamletam*; and Stow expounds it to be the seat of a freeholder. Several county towns have hamlets, as there may be several hamlets in a parish; and some particular places may be out of a town or hamlet, though not out of the county.

HAMMER, a well known tool used by mechanics, consisting of an iron head, fixed cross-wise upon a handle of wood.

There are several sorts of hammers used by blacksmiths; as, 1. The hand-hammer, which is of such weight that it may be wielded or governed with one hand at the anvil. 2. The up-hand sledge, used with both hands, and seldom lifted above the head. 3. The about-sledge, which is the biggest hammer of all, and held by both hands at the farthest end of the handle, and being swung at arms-length over the head, is made to fall upon the work with as heavy a blow as possible. There is also another hammer used by smiths, called a rivetting-hammer, which is the smallest of all, and is seldom used at the forge, unless upon small work. In large iron-works the forge-hammer is often worked by machinery.

To HA'MMER. *v. a.* (from the noun.) 1. To beat with a hammer (*Sandys*). 2. To forge or form with a hammer (*Dryden*). 3. To work in the mind; to contrive by intellectual labour (*Shakspeare*).

To HA'MMER. *v. n.* 1. To work; to be busy (*Shakspeare*). 2. To be in agitation (*Shakspeare*).

HA'MMERER. *s.* (from *hammer*.) He who works with a hammer.

HA'MMERHARD. *s.* (*hammer* and *hard*.) *Hammerhard* is when you harden iron or steel with much hammering on it (*Moxon*).

HAMMERSMITH, a large village of Middlesex, in the parish of Fulham, four miles W. of London, and on the N. side of the Thames.

HAMMOCK, or HAMAC, a kind of hanging bed, suspended between two trees, posts, hooks, or the like, much used throughout the West Indies, as also on board of ships. The Indians hang their hammocks to trees, and thus secure themselves from wild beasts and insects, which render lying on the ground there very dangerous. According to F. Plumier, who has often made use of the hammock in the Indies, it consists of a large strong coverlet or sheet of coarse cotton, about six feet square: on two opposite sides are loops of the same stuff, through which a string is run, and thereof other loops are formed, all which are tied together with a cord; and thus is the whole fastened to two neighbouring trees in the field, or two hooks in houses. This kind of couch serves at the same time for bed, quilts, sheets, pillow, &c. The hammock used on board of ships is made of a piece of canvas six feet long and three feet wide, gathered or drawn together at the two ends. There are usually from fourteen to twenty inches in breadth allowed between decks for every hammock in a ship of war; but this space must in some measure depend on the number of the crew, &c. In time of battle the hammocks and bedding are firmly corded and fixed in the nettings on the quarterdeck, or wherever the men are too much

exposed to the view or fire of the enemy.

HAMMOND (Henry), D.D. one of the most learned English divines of the 17th century, was born in 1605. He studied at Oxford, and in 1629 entered into holy orders. In 1633 he was inducted into the rectory of Penshurst in Kent. In 1643 he was made archdeacon of Chichester. In the beginning of 1645 he was made one of the canons of Christ-church, Oxford, and chaplain in ordinary to king Charles I. who was then in that city; and he was also chosen public orator of the university. In 1647 he attended the king in his confinement at Wooburn, Cavesham, Hampton-Court, and the Isle of Wight, where he continued till his majesty's attendants were again put from him. He then returned to Oxford, where he was chosen sub-dean; and continued there till the parliament-visitors first ejected him, and then imprisoned him for several weeks in a private house in Oxford. During this confinement he began his Annotations on the New Testament. At the opening of the year 1660, when every thing visibly tended to the restoration of the royal family, the doctor was desired by the bishops to repair to London to assist there in the composure of the breaches of the church, his station in which was designed to be the bishopric of Worcester; but on the 4th of April he was seized by a fit of the stone, of which he died on the 25th of that month, aged 55. Besides the above work he wrote many others; all of which have been published together in four volumes folio.

HAMMOND (Anthony), an English poet, was born at Somersham in Huntingdonshire, and educated at St. John's college, Cambridge. He was a member of parliament, and commissioner of the navy. He published a volume of poems, and wrote the Life of Mr. Moyle. He died about 1726, aged 59.

HAMMOND (James), the son of the above, was born in 1710, and educated at Westminster school. He was equerry to the prince of Wales, and member of parliament for Truro in Cornwall. Lord Chesterfield published a small volume of Love Elegies written by Mr. Hammond, with whom he had a great intimacy. He died in 1743, literally of a broken heart, because Miss Dashwood, the lady he addressed, was persuaded by her guardian, lord Harvey, to reject his suit. Miss Dashwood lived some years after him; but continued unmarried, and could never hear his name mentioned without evincing great agitation and the deepest grief.

HAMOUS. In natural history. Hooked. A bristle curved at the end, either in animals or vegetables.

HAMPDEN (John), a famous English patriot, was descended of an ancient family in Buckinghamshire, and born at London in 1594. He was cousin to Oliver Cromwell, and educated at Magdalen college, Oxford; which he left without taking a degree, and entered himself of one of the inns of court, but never followed the law as a profession. In 1636 he distinguished himself by his opposition to the payment of ship-money, by which he he acquired great popularity. He now became a leading man in the house of commons, and at the commencement of the civil war he took up arms against the king, but was cut off by a pistol shot in a skirmish in Oxfordshire in 1643. Lord Clarendon, after drawing his character at great length, concludes in these remarkable terms: "In a word, what was said of Cinna might well be applied to him: he had a head to contrive, a tongue to persuade, and a heart to execute any mischief." On the contrary, his panegyrists say, "He was a very wise man and of great parts; and possessed of the most absolute spirit of popularity to govern the people that ever was in any country: he was master over all his appetites and passions, and had thereby a very great ascendant over other men's: he was of an industry and vigilance never to be tired out, of parts not to be imposed upon by the most subtile, and of courage equal to his best parts."

HA'MPER, *s.* (*hanaperium*, low Latin.) A large basket for carriage (*Swift*).

To HA'MPER. *v. a.* 1. To shackle; to entangle, as in nets (*Herb.*). 2. To ensnare; to inveigle (*Shakspeare*). 3. To complicate; to tangle (*Blackmore*). 4. To perplex; to embarrass by many lets and troubles (*Hudibras*).

HAMPSHIRE, HANTS, or SOUTHAMPTON, a county of England, bounded on the N. by Berks. on the E by Surry and Sussex, on the S. by the English Channel, and on the W. by Dorsetshire and Wilts. It extends, exclusive of the Isle of Wight, 42 miles from N. to S. and 38 from E. to W. It is divided into 39 hundreds, and contains one city, 20 market-towns, and 253 parishes; and sends, with the Isle of Wight, 26 members to parliament. It is one of the most agreeable, fertile, and populous counties in England. The air, in the higher parts, is clear and pure; toward the sea, mild, and inclined to moisture. Its products are the finest corn (especially wheat), hops, cattle, sheep, wool, excellent bacon, honey, and timber. For the last it has been particularly famous, on account of its great woods, of which the principal are the New Forest, and the forest of East Bere. The principal rivers are the Avon, Test, Itchen, and Stour, This county contains 1,112,000 acres of land; of which about 210,000 are uncultivated, including woodlands. The houses, in 1800, amounted to 39,257, and the inhabitants to 219,656.

HAMPSHIRE (New), one of the United States of North America, bounded on the N. by Canada: on the N.E. by the province of Main; on the S.E. by the Atlantic Ocean; on the S. by Massachusets; and on the W. and N.W. by the river Connecticut, which separates it from Vermont. It is divided into the five counties of Rockingham, Stafford, Hillsborough, Cheshire, and Grafton. The land near the sea is generally low, but advancing into the country it rises into hills. The air is se-

rene and healthful: the weather not so subject to variation as in the more southern climes. From the vicinity of some mountains, whose summits are covered with snow three quarters of the year, this country is intensely cold in winter. In summer the heat is great, but of short duration. The capital is Portsmouth.

HAMPSTEAD, a village of Middlesex, formerly famous for its medicinal waters. It is seated on the declivity of a hill, on the top of which is a fine heath that commands a delightful prospect of the metropolis and all the adjacent country. It is four miles N.N.W. of London.

HAMSTER, in mastiology. See MUS.

HA'MSTRING. *s.* (*ham* and *string.*) The tendon of the ham (*Shakspeare*).

To HA'MSTRING. *v. a.* preter. and part. pass. *hamstrung*. To lame by cutting the tendon of the ham (*Dryden*).

HAMPTON, or MINCHING HAMPTON, a town in Gloucestershire, with a market on Tuesdays. Lat. 51. 36 N. Lon. 2. 15 W.

HAMPTON, a town of Middlesex, famous for a royal palace, called Hampton Court, built by cardinal Wolsey, who gave it to Henry VIII. The buildings, gardens, and parks to which king William made many additions, are four miles in circumference, and seated on the N. side of the Thames, 14 miles S.W. of London.

HAMPTON, a seaport of Virginia, near the mouth of James River. Lat. 37. 5 N. Lon. 76. 28 W.

HAMPTON, a seaport of New Hampshire. Lat. 43. 5 N. Lon. 74. 0 W.

HAMULUS. (*hamulus*, of *hamus*, a hook.) A term in anatomy, applied to any hook-like process, as the hamulus of the pterygoid process of the sphænoid bone.

HANAPER OFFICE, in the court of chancery, is that out of which all original writs issue that pass under the great seal, and all commissions of charitable uses, sewers, bankrupts, idiocy, lunacy, and the like. These writs, relating to the business of the subject, and the returns to them, were originally kept in a hamper, *in hanaperio*; the other writs, relating to such matters wherein the crown is immediately or mediately concerned, were preserved in a little sack or bag, *in parva baga*; and thence arises the distinction of the hanaper office, and petty bag office; both of which belong to the common law court in chancery.

HANAU, a county and principality of Germany, situated principally on the Maine, between the electorate of Mentz, bishopric of Fulda, and principality of Hesse Homburg, about fifteen leagues long, and five wide. It is esteemed one of the most fertile and rich countries in Germany, producing grain, legumes, exquisite wine, and delicious fruits. It contains magnificent forests, a rich salt mine, a copper mine, a silver mine, and a mine of cobalt. It was erected into a county in the year 1429. By the extinction of its hereditary counts it fell by compact to the landgrave of Hesse Cassel in 1736. Its assessment for a Roman month is two hundred and thirty florins, and taxed to the chamber of Wetzlar a hundred and sixty rixdollars twenty-five kruitzers. The principal town is of the same name, and is situated in lat. 49. 56 N. Lon. 8. 55 E.

HA'NCES. *s.* (in a ship.) Falls of the fiferails placed on banisters on the poop and quarterdeck down to the gangway.

HANCES, or HANCHES, in architecture, small parts of arches between the crown and the spring at the bottom, being perhaps about one-third of the arches, and situated nearer the bottom than the crown.

HAND, a part or member of the body of man, making the extremity of the arm. The hand is composed of the carpus or wrist, metacarpus, and fingers. The arteries of the hand are the palmary arch and the digital arteries. The veins are the digital, the cephalic of the thumb, and the salvatella. The nerves are the cutaneus externus and internus.

The mechanism of the hand is excellently contrived to fit it for various uses and occasions. It consists of a compages of muscles, tendons, and little bones connected with each other, which give it a great degree of strength, and at the same time an unusual flexibility, to enable it to handle adjacent bodies, lay hold of them, and grasp them, in order either to draw them towards us or thrust them off. Anaxagoras is represented by ancient authors, as maintaining, that man owes all his wisdom, knowledge, and superiority over other animals, to the use of his hands. Galen represents the matter otherwise: man, according to him, is not the wisest creature, because he has hands; but he had hands given him because he was the wisest creature. He truly said it was not our hands that taught us arts, but our reason which directed us in the use of our hands.

HAND, in the manage, the measure of a fist clenched, by which the height of a horse is computed. This measure is four inches, and three hands are consequently one foot; a horse of fifteen hands is exactly five feet high; and so above or below in proportion. This point at the entrance of horses for give-and-take plates, is regulated with a scrupulous nicety by means of a standard, so curiously constructed as to ascertain the exact height to the eighth of an inch where horses are matched to carry weight for inches.

Bridle-hand: the left hand is so termed, in distinction to the right, which is called the whip-hand; and the most experienced jockeys in racing, always take the whip-hand, if possible; it being considered a point in their favour; inasmuch as they have not only an advantage in the turns of the course, their adversaries being compelled to circumscribe a larger circle of many lengths in a four miles race, but are unrestrained in the use of the whip, should it come to a severe push at the run-in.

The word hand is employed technically in various phrases of the same science. To say a horse is light in hand, implies that he is playful, lively, champs his bit, is firm upon his

haunches, and dwells not upon the ground with his fore feet. A horse is heavy in hand, when, bearing his weight upon the bit, and lifting his fore legs with unwillingness, he proceeds plodlingly and reluctantly, exciting the fear of his tumbling. A vicious horse, breaking away with his rider, seems a dreadful sight to a spectator, but can never be attended with mischief if the rider be a good horseman, and has him " well in hand," which is, in fact, the power of " gathering him together," or stopping his career at pleasure.

Although the left is technically termed the bridle-hand, yet a good horseman, or experienced sportsman, will use either right or left with the most perfect ease and dexterity; to effect which with the greater freedom, young horsemen should constantly practise an exchange of the reins from one hand to the other in their daily excursions. The hand should be delicately alive to every motion of the horse; for it is a judicious management of this kind that constitutes entirely a good or bad mouth. A horse is supposed to gallop awkwardly (if not unnaturally) when he strikes into that pace with his left leg foremost; to prevent which, bear the rein to the left, with the bridle-hand, and he will invariably set off with the right leg.

Hand-gallop is that easy kind of pacing adapted to the aged and infirm, who wish to obtain every considerable motion with considerable ease. It is nearly synonymous with the canter. See CANTER and GALLOP.

A colt said to be " taken in hand," implies his being brought from his wild state of nature, to be handled, quieted, led about, and stabled, previous to his being broke in for the saddle or harness.

A horse's fore-hand includes the fore quarters, from the withers upwards to the tip of the ears; the principal beauty and attraction of which depend entirely upon the length and curve of the neck, which increases or diminishes his marketable value, in proportion as it is well or ill formed.

HANDS (Imposition or laying on of), signifies the conferring of holy orders; a ceremony wherein the hands are laid on the head of another, as a sign of a mission, or of a power given him to exercise the functions of the ministry belonging to the order. The apostles began to appoint missionaries by the imposition of hands. See IMPOSITION.

HAND, in falconry, is used for the foot of the hawk. To have a clean, strong, slender, glutinous hand, well clawed, are some of the good qualities of a hawk or falcon.

Other meanings of the word *hand*, with its etymology, as given by Dr. Johnson, are as below.

HAND. *s.* (hand, hond, Saxon.) 1. The palm with the fingers (*Berkley*). 2. Measure of four inches; a palm. 3. Side, right or left (*Exodus*). 4. Part; quarter; side (*Swift*). 5. Ready payment (*Tillotson*). 6. Rate; price (*Bacon*). 7. Terms; conditions; rate (*Tay*.). 8. Act; deed; external action (*K. Charles*). 9. Labour; act of the hand (*Addison*). 10. Performance (*Shakspeare*). 11. Power of performance (*Addison*). 12. Attempt; undertaking (*Spenser*). 13. Manner of gathering or taking (*Bacon*). 14. Workmanship; power or act of manufacturing or making (*Cheyne*). 15. Manner of acting or performing (*Dryden*). 16. Agency; part in action (*South*). 17. The act of giving or presenting (*Samuel*). 18. Act of receiving any thing ready to one's hand (*Locke*). 19. Care; necessity of managing (*Pope*). 20. Discharge of duty (*Hooker*). 21. Reach; nearness: as, at *hand*, within reach, near, approaching (*Boyle*). 22. Manual management (*Dryd*.). 23. State of being in preparation (*Shakspeare*) 24. State of being in present agitation (*Shak*.). 25. Cards held at a game (*Bacon*). 26. That which is used in opposition to another (*Hudibras*). 27. Scheme of action (*Ben Jonson*). 28. Advantage; gain; superiority (*Hayward*) 29. Competition; contest (*Shakspeare*). 30. Transmission; conveyance (*Colossians*). 31. Possession; power (*Hooker*). 32. Pressure of the bridle (*Shakspeare*). 33. Method of government; discipline; restraint (*Bacon*). 34. Influence; management (*Daniel*). 35. That which performs the office of a hand in pointing (*Locke*). 36. Agent; person employed (*Swift*). 37. Giver and receiver (*Tillotson*). 38. An actor; a workman; a soldier (*Dryden*). 39. Catch or reach without choice (*Milton*). 40. Form or cast of writing (*Felton*). 41. HAND *over head*. Negligently; rashly; without seeing what one does (*L'Estrange*). 42. HAND *to* HAND. Close fight (*Shakspeare*). 43. HAND *in* HAND. In union; conjointly (*Swift*). 44. HAND *in* HAND. Fit; pat (*Shakspeare*). 45. HAND *to Mouth*. As want requires. 46. *To bear in* HAND. To keep in expectation; to elude (*Shakspeare*). 47. *To be* HAND *and Glove*. To be intimate and familiar; to suit one another.

To HAND. *v. a.* (from the noun.) 1. To give or transmit with the hand (*Brown*). 2. To guide or lead by the hand (*Donne*). 3. To seize; to lay hands on (*Shakspeare*). 4. To manage; to move with the hand (*Prior*) 5. To transmit in succession; to deliver from one to another (*Woodward*).

HAND is much used in composition for that which is manageable by the hand, as a handsaw; or born in the hand, as a handbarrow.

HAND (Harmonical). See GAMMUT.

HA'ND-BARROW. *s.* A frame on which any thing is carried by the hands of two men, without wheeling on the ground (*Tusser*).

HAND-BASKET. *s.* A portable basket.

HAND-BELL. *s.* A bell rung by the hand.

HAND-BREADTH. *s.* A space equal to the breadth of the hand; a palm (*Arbuthnot*).

HAND-CUFFS, an instrument formed of two circular pieces of iron, each fixed on a hinge at the ends of a very short iron bar, which being locked over the wrists of a malefactor prevents his using his hands.

HA'NDED. *a.* (from *hand*.) 1. Having

the use of the hand left or right (*Brown*). 2. With hands joined (*Milton*).

HANDEL (George Frederic), an illustrious musician, was born at Hall in Upper Saxony in 1684. His father, who intended him for the law, perceiving his propensity to music, strictly prohibited all instruments from his house. The son, however, contrived to have a small clavichord concealed in the garret, where he used to amuse himself when the family was asleep. At the age of seven years he went with his father to the court of the duke of Saxe Weissenfels, to whom Handel's brother-in-law was valet. While there he got into the church one morning, and began to play on the organ. The duke, who was in the church, surprised at the playing, asked who it was, and on being informed, expostulated with the old gentleman for restraining his son's inclination; in consequence of which music was not only tolerated, but a master provided for him, who was Zackaw, the organist of the cathedral at Hall. Handel made so great a progress under this master, as shortly to become his assistant, and at the age of nine he actually composed the church service. In 1698 he went to Berlin, where he was greatly noticed by the king of Prussia. From Berlin he went to Hamburgh, and while there had a dispute with another musician, who basely made a push at him with his sword as they were coming out of the orchestra, but a music book being in his bosom prevented the weapon from piercing his heart. Here he composed, at the age of fourteen, his opera of Almeria, which had a great run. Soon after he visited Italy, and at Florence produced the opera of Rodrigo, for which he received a purse of a hundred sequins, and a service of plate. After travelling through the greatest part of Italy he returned to Germany, and 1710 came over to England; but being under an engagement to the elector of Hanover, his stay was short. However in 1712 he came hither again, and obtained a pension of two hundred pounds a year from queen Anne, which was afterwards doubled by George I. Some of the nobility projected a plan for erecting an academy in the Haymarket, which was to secure a constant supply of operas to be composed by Handel, and to be under his direction. This plan was carried into effect, and succeeded for about ten years, and then fell to the ground. The rage for Italian music prevailed, and the divine Handel could not stop the progress of the delusion. He then went to Ireland, where he met with a favourable reception. But in 1742 his popularity returned, and he retained his glory to the last. He died April 14th, 1759, and was buried in Westminster-abbey, where there is an elegant monument to his memory. This most eminent musician is universally allowed to have been a great epicure: in his temper he was very haughty, but was seldom or never guilty of mean actions. His pride was uniform; he was not by turns a tyrant and a slave. He appears to have had a most extravagant love for liberty and independence; insomuch, that he would, for the sake of liberty, do things otherwise the most prejudicial to his own interest. He was liberal even when poor, and remembered his former friends when he was rich. His musical powers can perhaps be best expressed by Arbuthnot's reply to Pope, who seriously asked his opinion of him as a musician; "Conceive (said he) the highest you can of his abilities, and they are much beyond any thing you can conceive."

A musical exhibition took place in Westminster-abbey some years ago, under the name of the Commemoration of Handel. It may justly be considered the grandest of the kind ever attempted in any nation. Of the rise and progress of the design, together with the manner in which the first celebration was executed, an accurate and amusing detail is given in the fourth volume of the History of Music, by Dr. Burney, who closes his observations on this memorable occasion with these words: "As this commemoration is not only the first instance of a band of such magnitude being assembled together, but of any band at all numerous, performing in a similar situation without the assistance of a manuductor to regulate the measure, the performances in Westminster-abbey may be safely pronounced no less remarkable for the multiplicity of voices and instruments employed, than for accuracy and precision. When all the wheels of that huge machine, the orchestra, were in motion, the effect resembled clock-work in every thing but want of feeling and expression. And as the power of gravity and attraction in bodies is proportioned to their mass and density, so it seems as if the magnitude of this band had commanded and impelled adhesion and obedience beyond that of any other of inferior force. The pulsations in every limb, and ramifications of veins and arteries in an animal, could not be more reciprocal, isochronous, and under the regulation of the heart, than the members of this body of musicians under that of the conductor and leader. The totality of sound seemed to proceed from one voice and one instrument; and its powers produced not only new and exquisite sensations in judges and lovers of the art, but were felt by those who never received pleasure from music before. These effects, which will long be remembered by the present public, perhaps to the disadvantage of all other choral performances, run the risk of being doubted by all but those wh heard them, and the present description of being pronounced fabulous if it should survive the present generation."

HA'NDER. *s.* (from *hand.*) Transmitter; conveyor in succession (*Dryden*).

HA'NDFAST. *s.* (*hand* and *fast.*) Hold; custody: obsolete (*Shakspeare*).

HA'NDFUL. *s.* (*hand* and *full.*) 1. As much as the hand can gripe or contain (*Addison*). 2. A palm; a hand's breadth (*Bacon*). 3. A small number or quantity (*Clarendon*). 4. As much as can be done (*Raleigh*).

HAND-GUN. *s.* A gun wielded by the hand.

HANDICAP, a term in the sportsman's dialect, applicable to match, plate, or sweepstakes, in the following way:

First as to a handicap match. A, B, and C, put an equal sum into a hat. C, who is the handicapper, makes a match for A and B, who, when they have perused it, put their hands into their pockets, and draw them out closed; then they open them together, and if both have money in their hands, the match is confirmed; if neither have money, it is no match: in either of these cases, the handicapper C draws all the money out of the hat to his own use; but if one have money in his hand, and the other none, although it is no match, he that has the money in his hand is entitled to the whole deposit in the hat instead of the handicapper.

A handicap plate is the gift of an individual, or raised by subscription, for which horses are generally declared the day before running, at a certain hour, by written information privately delivered to the clerk of the course, whose province it is to make out the list, and hand it to the steward of the race; when the weight each horse must carry is irrevocably fixed, by whomsoever the steward may appoint, and appears in the printed lists of the following morning. Horses thus entered, and declining the weight appointed for them to carry, are of course permitted to be withdrawn, without any forfeit or loss.

HA'NDICRAFT. *s.* (*hand* and *craft.*) 1. Manual occupation (*Addison*). 2. A man who lives by manual labour (*Swift.*)

HANDICRA'FTSMAN. *s.* A manufacturer; one employed in manual occupation (*Swift*).

HA'NDILY. *ad.* (from *handy.*) With skill; with dexterity.

HA'NDINESS. *s.* (from *handy.*) Readiness; dexterity.

HANDING, is sometimes used to express the taking hold of a cock during his battle in the pit. This, however, is a mere provincial term, the hander of the cocks being now more generally known by the denomination of a setter-to. See Cockpit Royal.

HA'NDIWORK. *s.* (*handy* and *work.*) Work of the hand; product of labour; manufacture (*L'Estrange*).

HA'NDKERCHIEF. *s.* (*hand* and *kerchief.*) A piece of silk or linen used to wipe the face, or cover the neck (*Arbuthnot*).

To HA'NDLE. *v. a.* (*handelen*, Dutch.) 1. To touch; to feel with the hand (*Locke*). 2. To manage; to wield (*Shakspeare*). 3. To make familiar to the hand by frequent touching (*Temple*). 4. To treat; to mention in writing or talk (*Atterbury*). 5. To deal with; to practise (*Jeremiah*). 6. To treat well or ill (*Clarendon*). 7. To practise upon; to transact with (*Shakspeare*).

Ha'ndle. *s.* (handle, Saxon.) 1. That part of any thing by which it is held in the hand; a haft (*Taylor*). 2. That of which use is made (*South*).

HA'NDLESS. *a.* Without a hand (*Shaks.*).

HANDLING, a term applied by cockers to the judicious examination of a cock by the hand when brought up from his walk, to ascertain whether he is in proper condition to be placed in the pens, and prepared to fight in either the main battles or the byes. This is done by a particular mode of taking the girt of the body by grasp, to discover the shape and substance, the bone, and strength, as well as the firmness or flaccidity of the flesh; upon the aggregate of which so much depends, that in proportion to these qualifications he is accepted or rejected.

HA'NDMAID. *s.* A maid that waits at hand.

HA'NDMILL. *s.* A mill moved by the hand.

HAND-RAIL, in architecture, the rail running along the tops of the ballusters by the sides of open galleries, staircases, &c. Hand-rails are not merely ornaments, they are often absolutely necessary; hand-rails to staircases generally begin from the ground by a twisted scrall, which, when skilfully managed, produces a very good effect.

HANDS *off*. A vulgar phrase for keep off; forbear (*L'Estrange*).

HA'NDSAILS. *s.* Sails managed by the hand.

HA'NDSAW. *s.* A saw manageable by the hand (*Mortimer*).

HA'NDSEL. *s.* (*hansel*, Dutch.) The first act of using any thing; the first act of sale.

To Ha'ndsel. *v. a.* To use or do any thing the first time (*Cowley*).

HA'NDSOME. *a.* (*handsaem*, Dutch.) 1. Ready; gainly; convenient (*Spenser*). 2. Beautiful with dignity; graceful (*Addison*). 3. Elegant; graceful (*Felton*). 4. Ample; liberal: as, *a* handsome *fortune*. 5. Generous; noble: as, *a* handsome *action*.

To Ha'ndsome. *v. a.* (from the adjective.) To render elegant or neat (*Donne*).

HA'NDSOMELY. *ad.* (from *handsome.*) 1. Conveniently; dexterously (*Spenser*). 2. Beautifully; gracefully. 3. Elegantly; neatly (*Wisdom*). 4. Liberally; generously (*Addison*).

HA'NDSOMENESS. *s.* (from *handsome.*) Beauty; grace; elegance (*Boyle*).

HAND-SPIKE, or Hand-spec, a lever, or piece of ash, elm, or other strong wood, five or six feet long, cut thin like a wedge at one end, that it may get the easier betwixt things which are to be separated, or under any thing that is to be raised; it is better than a crow of iron, because its length allows a better poise.

Hand-spikes are used in ships, to traverse the ordnance, to heave with in a windlass, to weigh up the anchor, &c. The gunners hand-spike is shorter and flatter than the other, and armed with two claws, for the purpose of managing the artillery in battle, &c.

HA'NDVICE. *s.* (*hand* and *vice.*) A vice to hold small work in (*Moxon*).

HA'NDWRITING. *s.* A cast or form of writing peculiar to each hand (*Cockburn*).

HA'NDY. *a.* (from *hand*). 1. Executed on

performed by the hand. 2. Ready; dexterous; skilful (*Dryden*). 3. Convenient; ready to the hand (*Moxon*).

HA'NDYDANDY. *s.* A play in which children change hands and places (*Shak.*).

To HANG. *v. a.* preter. and part. pass. *hanged*, or *hung*, anciently *hong*. (hangan, Saxon.) 1. To suspend; to fasten in such a manner as to be sustained, not below, but above (*South*). 2. To place without any solid support (*Sandys*). 3. To choke and kill by suspending by the neck (*Shakspeare*). 4. To display; to show aloft (*Addison*). 5. To let fall below the proper situation (*Dryden*). 6. To fix in such a manner as in some directions to be moveable (*Maccabees*). 7. To cover or charge by any thing suspended (*Dryden*). 8. To furnish with ornaments or draperies fastened to the wall (*Bacon*).

To HANG. *v. n.* 1. To be suspended; to be supported above, not below (*Spenser*). 2. To depend; to fall loosely on the lower part; to dangle (*Dryden*). 3. To bend forward (*Addison*). 4. To float; to play (*Prior*). 5. To be supported by something raised above the ground (*Addison*). 6. To rest upon by embracing (*Peacham*). 7. To hover; to impend (*Atterbury*). 8. To be loosely joined (*Shakspeare*). 9. To drag; to be incommodiously joined. 10. To be compact or united (*Addison*). 11. To adhere, unwelcomely or incommodiously (*Addison*). 12. To rest; to reside (*Shakspeare*). 13. To be in suspense; to be in a state of uncertainty (*Deuteronomy*). 14. To be delayed; to linger (*Milton*). 15. To be dependant on (*Shakspeare*). 16. To be fixed or suspended with attention. 17. To have a steep declivity (*Mortimer*). 18. To be executed by the halter (*Pope*). 19. To decline; to tend down (*Pope*).

HANG-TCHEOU-FOU, the metropolis of the province of Tche-kiang in China. It is, according to the Chinese, the paradise of the earth; and may be considered as one of the richest, best situated, and largest cities of the empire. It is four leagues in circumference, exclusive of its suburbs; and the number of its inhabitants amounts to more than a million. It is computed, that there are a thousand workmen within its walls employed in manufacturing silk. What renders this city delightful is a small lake, called Si-hou, which washes the bottom of its walls on the western side; its water is pure and limpid, and its banks are almost every where covered with flowers. This city has under its jurisdiction seven cities of the second and third class. Lat. 30. 21 N. Lon. 120. 20 E.

HA'NGER. *s.* (from *hang*.) That by which any thing hangs: as, *the pot* hangers.

HA'NGER. *s.* (from *hang*.) A short broad sword.

HA'NGER-ON. *s.* (from *hang*.) A dependant (*Brown. Swift*).

HA'NGING. *s.* (from *hang*.) Drapery hung or fastened against the walls of rooms (*Dryden*).

HA'NGING. *participial a.* (from *hang*.) 1. Foreboding death by the halter (*Shakspeare*). 2. Requiring to be punished by the halter.

HANGING LEAF. In botany, a leaf pointing directly to the ground.

HANGINGS, denote any kind of drapery hung up against the walls, or wainscot of a room: there are also window-hangings, bed-hangings, &c.

HA'NGMAN. *s.* (*hang* and *man*.) The public executioner (*Sidney*).

HANK. *s.* (*hank*, Islandick.) 1. A skein of thread. 2. A tie; a check; an influence (*Decay of Piety*).

To HA'NKER. *v. n.* (*hankeren*, Dutch.) To long importunately (*Addison*).

HANNIBAL, or ANNIBAL, a celebrated Carthaginian general, son of Amilcar. He was educated in his father's camp, and inured from his early years to the labours of the field. He passed into Spain when nine years old, and at the request of his father took a solemn oath he never would be at peace with the Romans. After his father's death he was appointed over the cavalry in Spain; and some time after, upon the death of Asdrubal, he was invested with the command of all the armies of Carthage, though not yet in the twenty-fifth year of his age. In three years of continual success, he subdued all the nations of Spain which opposed the Carthaginian power, and took Saguntum after a siege of eight months. This was the cause of the second Punic war. He levied three large armies, one of which he sent to Africa, he left another in Spain, and marched at the head of the third towards Italy. He came to the Alps, deemed almost inaccessible, and gained the top in nine days, having softened the rocks with fire and vinegar. After he had defeated P. Corn. Scipio and Sempronius, near the Rhone, the Po, and the Trebia, he crossed the Apennines, and invaded Etruria. He defeated the consul Flaminius near the lake Trasimenus, and soon after met the two consuls C. Terentius and L. Æmilius at Cannæ. His army consisted of 40,000 foot, and 10,000 horse, when he engaged the Romans at the celebrated battle of Cannæ. No less than 40,000 Romans were killed, and as a sign of his victory, he sent to Carthage three bushels of gold rings which had been taken from 5630 Roman knights slain in the battle. He did not make a proper use of his victory, by not marching immediately to Rome, which gave the enemy some respite, and contributed to renovate their spirits, but retired to Capua, which, on account of its pleasures and luxury, became a Cannæ to him. After the battle of Cannæ the Romans became more cautious, and after many important debates in the senate, it was decreed, that war should be carried into Africa, to remove Hannibal from the gates of Rome, and Scipio, who proposed the plan, was empowered to put it into execution. This recalled Hannibal from Italy. The seat of war being thus transferred, he and Scipio met near Carthage, and determined to come to a general engagement. The battle was fought near Zama: Scipio made a great slaughter of

the enemy; 20,000 were killed, and the same number made prisoners. Hannibal, after he had lost the day, fled to Adrumetum, afterwards to Syria, to king Antiochus, whom he advised to make war against Rome. Antiochus being conquered by the Romans, and distrusting Hannibal, agreed to deliver him up to them; being apprized of this, Hannibal left the court of Antiochus, and fled to Prusias, king of Bithynia, whom he encouraged to declare war against Rome. The senate having received intelligence that Hannibal was in Bithynia, immediately sent ambassadors to demand him of Prusias. The king was unwilling to betray Hannibal, though he dreaded the power of Rome; but Hannibal extricated him from his embarrassment, by taking a dose of poison, which he always carried with him in a ring on his finger. As he breathed his last, he exclaimed, *Solvamus diuturna cura populum Romanum, quando mortem senis expectare longum censet.* He died in his 70th year, according to some, about 182 years B. C. That year was famous for the death of the three greatest generals of the age, Hannibal, Scipio, and Philopoemen. Livy has painted the character of Hannibal like an enemy, and it is much to be lamented that a great historian has withheld the tribute due to the merit and virtues of the greatest general. (*Livy*).

HANOVER, a town of Germany, capital of the king of Great Britain's German dominions, before they were wrested from him by the French. The electors resided here before George I. ascended the British throne. The regency was administered in the same manner as if the sovereign were present. It is a large well-built town, and well fortified. The established religion is the Lutheran; but the Roman Catholics are tolerated, and have a handsome church. Hanover is seated on the river Leina. Lat. 52. 25 N. Lon. 10. 5 E.

HANOVER, an electorate of Germany, which comprehended, at first, nothing but the county of Lawenroad; but now it contains the duchy of Zell, Saxe-Lawenburg, Bremen, Lunenburg, the principality of Verden, Crubenhagen, and Oberwald. George I. king of Great Britain was the first that gained possession of all these states, which lie mostly between the rivers Weser and Elbe, and extend 200 miles in length from S. W.; but the breadth is different, being in some places 150 miles, and in others but 50. Their produce is timber, cattle, hogs, mum, beer, and bacon; a little silver, copper, lead, iron, vitriol, brimstone, quicksilver, and copperas.

HANOVER (New), an island in the Pacific Ocean, seen by captain Carteret, in the year 1767, about ten leagues in length. The south-west part situated in lon. 148. 27 E. Greenwich; lat. 2. 49 S.

HANOVER, a town in the state of Virginia, situated on the York River. Lat. 37. 47 N. Lon. 77. 25 W. There are three other towns in America bearing the same name, but of smaller note.

HANSE, or HANS, an ancient name for a society or company of merchants; particularly that of certain cities in Germany, &c. hence called Hanse-towns. The word *hanse* is obsolete High Dutch or Teutonic; and signifies "alliance, confederacy, association," &c.

HANSE-TOWNS. The hanseatic society was a league between several maritime cities in Germany, for the mutual protection of their commerce. Bremen and Amsterdam were the two first that formed it; whose trade received such advantage by their fitting out two men of war in each to convoy their ships, that more cities continually entered into the league: even kings and princes made treaties with them, and were often glad of their assistance and protection; by which means they grew so powerful both by sea and land, that they raised armies as well as navies, enjoyed countries in sovereignty, and made peace or war, though always in defence of their trade, as if they had been an united state or commonwealth.

At this time also abundance of cities, though they had no great interest in trade, or intercourse with the ocean, came into their alliance for the preservation of their liberties: so that in the year 1200 we find no less than 72 cities in the list of the towns of the Hanse; particularly Bremen, Amsterdam, Antwerp, Rotterdam, Dort, Bruges, Ostend, Dunkirk, Middleburgh, Calais, Rouen, Rochelle, Bourdeaux, St. Malo, Bayonne, Bilboa, Lisbon, Seville, Cadiz, Carthagena, Barcelona, Marseilles, Leghorn, Naples, Messina, London, Lubec, Rostock, Stralsund, Stetin, Wismar, Konigsberg, Dantzig, Elbing, Marienburg. But this hanse or union has for some time been dissolved; and now every one of the cities carries on a trade separately for itself, according to the stipulation in such treaties of peace, &c. as are made for the empire betwixt the emperor and other potentates.

HAN'T, for *has not* or *have not* (*Addison*).

HAN-TCHONG-TOU, a large and populous city of China, in the province of Chensi. It has 16 cities of the 2d and 3d class under its jurisdiction, and is seated on the river Han. Lat. 32. 45 N. Lon. 106. 55 E.

HANUYE, a town of Austrian Brabant. Lat. 50. 41 N. Lon. 5. 16 E.

HANWAY (Jonas), an English philanthropist, was born at Portsmouth in 1712, and being bred a merchant, formed a connexion with a commercial house at Petersburgh, by which means he took a journey to Persia, of which he afterwards published an account. On settling in London, Mr. Hanway devoted a considerable portion of his time to benevolent purposes, and perhaps was concerned in projecting more charitable institutions than any man that ever lived. Of this number, were the marine society, and the Magdalen hospital. For these exertions he was made a commissioner of the navy; and when he resigned his seat at the board his salary was continued. He died in 1786. His works are very numerous, but those which we have mentioned are the best. One curious publication of his the future

of the subject induces us to mention a little more particularly: it was entitled "Eight Letters to —— Duke of ——, on the Custom of Vails-giving in England," 8vo. This practice of giving vails had arrived at a very extravagant pitch, especially among the servants of the great. It was Mr. Hanway who answered the kind reproach of a friend in a high station for not coming oftener to dine with him, by saying, "Indeed I cannot afford it." The nobleman to whom the above letters were addressed was the duke of Newcastle. The letters are written in that humorous style which is most attractive of general notice, and was best adapted to the subject. Sir Timothy Waldo first put Mr. Hanway on this plan. Sir Timothy had dined with the duke of N——, and, on his leaving the house, was contributing to the support and insolence of a train of servants who lined the hall; and at last put a crown into the hand of the cook, who returned it, saying, "Sir, I do not take silver."—"Don't you indeed?" said the worthy baronet, putting it in his pocket; "then I do not give gold." Among the ludicrous circumstances in Mr. Hanway's letters is one which happened to himself. He was paying the servants of a respectable friend for a dinner which their master had invited him to, one by one as they appeared; "Sir, your great-coat;" a shilling—"Your hat;" a shilling—"Stick;" a shilling—"Umbrella;" a shilling—"Sir, your gloves;" "Why, friend, you may keep the gloves; they are not worth a shilling."

HAP. *s.* (*anhap.* in Welsh, is misfortune.) 1. Chance; fortune (*Spenser*). 2. That which happens by chance (*Sidney*). 3. Accident; casual event (*Fairfax*).

HAP-HAZARD. *s.* Chance; accident (*Locke*).

To HAP. *v. n.* (from the noun.) To come by accident; to fall out; to happen (*Bacon*).

HAPAEE, the name of four of the Friendly Islands in the S. Pacific Ocean. They are of a similiar height and appearance, and connected by a reef of coral rocks, dry at low water. The plantations are very numerous and extensive.

HA'PLESS. *a.* (from *hap.*) Unhappy; unfortunate; luckless (*Smith*).

HA'PLY. *ad.* (from *hap.*) 1. Perhaps; peradventure; it may be (*Rowe*). 2. By chance; by accident (*Milton*).

To HA'PPEN. *v. n.* (from *hap.*) 1. To fall out; to chance; to come to pass (*Tillots.*). 2. To light; to fall by chance (*Graunt*).

HA'PPILY. *ad.* (from *happy.*) 1. Fortunately; luckily; successfully (*Dryden*). 2. Addressfully; gracefully; without labour (*Pope*). 3. In a state of felicity: as, he lives *happily*.

HA'PPINESS. *s.* (from *happy.*) 1. Felicity; state in which the desires are satisfied (*Hooker*). 2. Good luck; good fortune. 3. Fortuitous elegance (*Denham*).

The words *happy, content, satisfied, pleased, happiness, contentment, satisfaction, pleasure,* all denote the state of a man who has what he wishes.

The difference of their several meanings arises from the duration of this state, and from the degree of enjoyment afforded by the object of a man's wishes.

Satisfaction and *contentment* denote only that situation in which we have no more wishes that we should like to see gratified. This situation is the opposite of that inquietude which unaccomplished wishes occasion. No wishes disquiet us any longer; what we have fills or suffices us.

But satisfaction and satisfied, denote merely a situation of short duration; that situation, namely, which follows immediately after the fulfilment of a wish or of a desire. *Content* and *contentment* mark an habitual situation uninterrupted by any fresh wishes. Hence contentment refers to the whole desiring faculty; satisfaction simply to one particular desire. We say of a wish, a desire, a passion, that they are *satisfied*; of the heart, that it is *content*.

The miser who sees his wish, his desire, his anxiety, his passion, to increase his heap of gold satisfied, is nevertheless not content; his heart and soul feel no contentment; he still forms fresh wishes, and his passion has never enough.

The satisfying of our wishes frequently excites fresh ones, and tends rather to impede than to promote contentment.

We ought not to *satisfy* every desire of our children, that they may be early accustomed to be *content*.

No person can have all that he wishes, says Seneca, but every one may do without that which he has not, by quietly enjoying what falls to his share. Our desires are never satisfied; but nature is content with little.

The difference of *satisfied* and *content*, from *pleased* and *happy* is this: satisfaction and contentment denote merely the being freed from unaccomplished wishes, either by the possession of the wished-for object, or of some equivalent. Pleasure and happiness denote the enjoyment of the object, or the joy which the consciousness of possessing it causes, whether we have wished and procured it ourselves, or whether we have got it without either wishing for it, or doing any thing to obtain it.

Happiness differs from *pleasure* by its duration. A single pleasure, or even several pleasures, may be scattered over the whole dark picture of life, as rare luminous points, and yet the whole life, or the person to whose share these pleasures fall, cannot be called happy. Hence, it is justly asserted, that the man who spends his life in sensual pleasures is not to be reckoned happy. Sensual pleasures, if we addict ourselves to them alone, are attended with disagreeable and painful consequences; and should they even not be immediately followed by such disagreeable and painful circumstances, he who hunts after sensual pleasures only, is, however, debarred from the enjoyment

of more refined and nobler pleasures. *Happiness is the uninterrupted enjoyment of the best pleasures.* The rude joy of the savage gives him at times the sensation of pleasure: but he is not happier than the member of a civilized community. The constant alternative of intemperance and want frequently disturbs his pleasure, and his rudeness deprives him of the more refined pleasures enjoyed by man in a state of civilization.

If *happiness* be superior to *pleasure* in duration, it is superior to *contentment* in intensity. All men may be equally content, either because ignorance precludes them from wishing for more than they possess, or because they know how to limit their wishes. But all men are not equally happy. They cannot all possess an equal share of good things: and if they did, they are not all equally capable of enjoying them. Hume's assertion, that all who are equally content, the little girl in her new gown, the commander at the head of a victorious army, the orator after having delivered a brilliant speech in a large assembly, are equally happy, must be pronounced erroneous. Happiness consists, farther, *in the variety of the agreeable sensations of which we are conscious.* A peasant has not the capacity of enjoying equal happiness with a philosopher. A large glass and a small one may both be filled to the brim, yet the larger one holds more liquor than the small one.

Were the savage even content in his situation, it would still be wrong to infer from thence, with Rousseau, that he ought to be left in that situation. Man's vocation is happiness. So true it is that the most splendid paradoxes are frequently built upon undefined ideas; and that, in the investigation of philosophical subjects, the accurate discrimination of the terms employed is of the highest importance. (*Eberhard*).

The result of Dr. Paley's enquiry into the nature of happiness in his Moral and Political Philosophy, is comprised in the following propositions.

I. Happiness does not consist in
  1st. Pleasures of sense,
  Because they are of short duration at the time;
  Because they cloy by repetition;
  Because eagerness for intense delights takes away relish for others.
These objections are valid, independent of loss of health, &c.
  2d. In exemption from evils which are without, as labour, &c.
  Because the mind must be employed.
  Hence pain is sometimes a relief to the uneasiness of vacuity.
  3d. In greatness, or elevated station.
  Because the highest in rank are not happiest, and so in proportion.
  Because superiority, where there is no competition, is seldom contemplated.
II. Happiness is to be judged of by the apparent happiness of mankind, which consists in
  1st. *The exercise of the social affections.*
  2d. The exercise of the faculties of body or mind for an engaging end,
  Because there is no happiness without something to hope for.
  Those pleasures are most valuable which are most productive of engagement in the pursuit.
  Therefore *endeavours after happiness in a future state produce greatest happiness in this world.*
  3d. In a prudent constitution of habits.
  Habits of themselves are much the same, because what is habitual becomes nearly indifferent;
  Therefore those habits are best which allow of indulgence in the deviation from them.
  Hence that should not be chosen as a habit, which ought to be a refreshment.
  Hence by a perpetual change the stock of happiness is soon exhausted.
  4th. In health of body and good spirits.
  Because necessary for the full enjoyment of every pleasure.
  Because itself is a pleasure, perhaps the sole happiness of some animals.

From the above, Dr. Paley deduces two conclusions:
  1st. Happiness appears to be pretty equally distributed.
  2d. Vice has no advantage over virtue with respect to this world's happiness. —*Paley*. Book i. chap. 6.

We are old-fashioned enough to add, that nothing in our estimation can tend more to the production of genuine happiness than the cultivation of the dispositions of mind and heart recommended by our Lord in Matthew chap. v. verses 3—12.

Indeed the word *happy* answers more exactly to μακάριοι, than the word *blessed* retained in the received version; and Jesus Christ seems manifestly to intimate by it, not only that the dispositions there recommended would lead the way to future blessedness, but that they would immediately be attended with the truest happiness, and the noblest pleasures.

HA'PPY. *a.* (from *hap.*) 1. In a state of felicity (*Sidney*). 2. Lucky; successful; fortunate (*Boyle*). 3. Addressful; ready (*Swift*).

HAPSAL, a seaport of Russia, in the government of Revel, seated on the Baltic. Lat. 59. 4 N. Lon. 22. 47 E.

HA'QUETON. *s.* A coat of mail (*Spenser*).

HARAM. See SERAGLIO.

HARANGUE, a modern French name for a speech or oration made by an orator in public. Menage derives the word from the Italian *arenga*, which signifies the same; formed, according to Ferrari, from *arringo*, "a just, or place of justing." Others derive it from the Latin *ara*, "altar;" by reason the first harangues were made before altars: whence the verse of Juvenal, "*Aut Lugdunensis rhetor dicturus ad aram.*" Harangues were usually made by the generals previous to an engage-

ment both amongst the Greeks and Romans. An harangue on such occasions was called *allocutio*. The word is also frequently used in a ludicrous sense, viz. for a too pompous, prolix, or unseasonable speech or declamation.

To HARA'NGUE. *v. n.* (*haranguer*, Fr.) To make a speech; to pronounce an oration.

HARA'NGUER. *s.* (from *harangue*.) An orator; a public speaker.

To HA'RASS. *v. a.* (*harasser*, French.) To weary; to fatigue (*Addison*).

HA'RASS. *s.* (from the verb.) Waste; disturbance (*Milton*).

HA'RBINGER. *s.* (*herberger*, Dutch.) A forerunner; a precursor (*Dryden*).

HARBOROUGH, or MARKET HARBOROUGH, a town in Leicestershire, with a market on Tuesdays. It is seated on the Welland. Lat. 52. 28 N. Lon. 0. 52 W.

HARBOUR, a place where ships may ride safe at anchor, chiefly used in speaking of those secured by a boom and chain, and furnished with a mole. The bottom of a good harbour should be free from rocks and shallows: the entrance should be of sufficient extent to admit large ships: it should have good anchoring ground, and be easy of access: it should have room and convenience to receive the shipping of different nations: it should be furnished with a good light-house, and have at command plenty of wood and other materials for firing, besides hemp, iron, &c.

HARBOUR MASTER, an officer appointed to inspect the moorings, and to see that the laws and regulations of the harbour are strictly attended to by the different ships.

HARBOUR, among sportsmen, is a term applicable solely to deer, and used alone in stag hunting. The harbour of a deer implies his covert; and hence upon drawing for an outlying deer he is said, upon being found, to be *unharboured*, as the hare is said to be *started*, and the fox *unkennelled*.

HA'RBOUR. *s.* (*herberge*, French.) 1. A lodging; a place of entertainment (*Dryden*). 2. An asylum; a shelter.

To HA'RBOUR. *v. n.* (from the noun.) To receive entertainment; to sojourn (*Dryden*).

To HA'RBOUR. *v. a.* 1. To entertain; to permit to reside (*Rowe*). 2. To shelter; to secure (*Sidney*).

HA'RBOURAGE. *s.* (*herbergage*, French.) Shelter; entertainment (*Shakspeare*).

HA'RBOURER. *s.* (from *harbour*.) One that entertains another.

HA'RBOURLESS. *a.* (from *harbour*.) Wanting harbour; being without lodging.

HARD. *a.* (heapᵭ, Saxon; *hard*, Dutch.) 1. Firm; resisting penetration or separation; not soft (*Shakspeare*). 2. Difficult; not easy to the intellect (*Arbuthnot*). 3. Difficult of accomplishment (*Dryden*). 4. Painful; distressful; laborious (*Clarendon*). 5. Cruel; oppressive; rigorous (*Atterbury*). 6. Sour; rough; severe (*Shakspeare*). 7. Unfavourable; unkind (*Dryden*). 8. Insensible; inflexible (*Dryden*). 9. Unhappy; vexatious (*Temple*). 10. Vehement; keen; severe: as, a hard *winter*; hard *weather*. 11. Unreasonable; unjust (*Swift*). 12. Forced; not easily granted (*Burnet*). 13. Powerful; forcible (*Watts*). 14. Austere; rough, as liquids (*Bacon*). 15. Harsh; stiff; constrained (*Dry.*). 16. Not plentiful; not prosperous (*Dryden*). 17. Avaricious; faultily sparing.

HARD. *ad.* (*hardo*, German.) 1. Close; near (*Judges*). 2. Diligently; laboriously; incessantly (*Dryden*). 3. Uneasily; vexatiously (*Shakspeare*). 4. Distressfully (*L'Est.*) 5. Fast; nimbly; vehemently (*L'Estrange*). 6. With difficulty (*Bacon*). 7. Tempestuously; boisterously (*Taylor*).

HARD-BEAM TREE. See CARPINUS.

HA'RDBOUND. *a.* (*hard* and *bound*.) Costive (*Pope*).

To HARDEN. *v. a.* (from *hard*.) 1. To make hard; to indurate (*Woodward*.) 2. To confirm in effrontery; to make impudent. 3. To confirm in wickedness; to make obdurate (*Addison*). 4. To make insensible; to stupify (*Swift*). 5. To make firm; to endue with constancy (*Dryden*).

To HA'RDEN. *v. n.* To grow hard (*Bacon*).

HA'RDENER. *s.* (from *harden*.) One that makes any thing hard.

HARDERWYCK, a town of Dutch Guelderland, with a university. It is seated on the Zuyder Zee. Lat. 52. 23 N. Lon. 5. 40 E.

HARDESIA. See LAPIS HIBERNICUS.

HARDFA'VOURED. *a.* (*hard* and *favour*.) Coarse of feature (*Dryden*).

HARDHA'NDED. *a.* (*hard* and *hand*.) Coarse; mechanic (*Shakspeare*).

HA'RDHEAD. *s.* (*hard* and *head*.) Clash of heads (*Dryden*).

HARDHE'ARTED. *a.* (*hard* and *heart*.) Cruel; inexorable; merciless; pitiless (*Arbuthnot*).

HARDHE'ARTEDNESS. *s.* (from *hardhearted*.) Cruelty; want of tenderness (*South*).

HA'RDIHEAD. HA'RDIHOOD. *s.* (from *hardy*.) Stoutness; bravery: obsolete (*Milton*).

HA'RDIMENT. *s.* (from *hardy*.) Courage; stoutness; bravery: not in use (*Fairfax*).

HA'RDINESS. *s.* (from *hardy*.) 1. Hardship; fatigue (*Spenser*). 2. Stoutness; courage; bravery (*Shakspeare*). 3. Effrontery; confidence.

HARDLA'BOURED. *a.* (*hard* and *labour*.) Elaborate; studied (*Swift*).

HA'RDLY. *ad.* (from *hard*.) 1. With difficulty; not easily (*South*). 2. Scarcely; scant; not lightly (*Swift*). 3. Grudgingly, as an injury (*Shakspeare*). 4. Severely; unfavourably (*Hooker*). 5. Rigorously; oppressively (*Swift*). 6. Unwelcomely; harshly (*Locke*). 7. Not softly; not tenderly (*Dryden*).

HA'RDMOUTHED. *a.* (*hard* and *mouth*.) Disobedient to the rein; not sensible of the bit (*Dryden*).

HA'RDNESS. *s.* (from *hard*.) 1. Durity; power of resistance in bodies. 2. Difficulty to be understood (*Shakspeare*). 3. Difficul-

ty to be accomplished (*Sidney*). 4. Scarcity; penury (*Swift*). 5. Obduracy; profligateness (*South*). 6. Coarseness; harshness of look (*Ray*). 7. Keenness; vehemence of weather (*Mor.*). 8. Cruelty of temper; savageness (*Shaks.*). 9. Stiffness; harshness (*Dryden*). 10. Faulty parsimony; stinginess.

HARDNESS, or RIGIDITY, that quality in bodies by which their parts so cohere as not to yield inward, or give way to an external impulse, without instantly going beyond the distance of their mutual attraction; and therefore are not subject to any motion in respect of each other without breaking the body.

Newton conjectures that the primary particles of all bodies, whether solid or fluid, are perfectly hard; and are not capable of being broken or divided by any power in nature. These particles, he maintains, are connected together by an attractive power; and according to the circumstances of this attraction, the body is either hard, or soft, or even fluid. If the particles be so disposed or fitted for each other as to touch in large surfaces, the body will be hard; and the more so as those surfaces are the larger. If, on the contrary, they only touch in small surfaces, the body, by the weakness of the attraction, will remain soft.

Hardness appears to diminish the cohesion of bodies, in some degree, though their frangibility or brittleness does not by any means keep pace with their hardness. Thus, though glass be very hard and very brittle; yet flint is still harder, though less brittle. Among the metals, these two properties seem to be more connected, though even here the connection is by no means complete; for though steel be both the hardest and most brittle of all the metals, yet lead, which is the softest, is not the most ductile. Neither is hardness connected with the specific gravity of bodies; for a diamond, the hardest substance in nature, is little more than half the weight of the lightest metal. And as little is it connected with the coldness, or electrical properties, or any other quality with which we are acquainted. Some bodies are rendered hard by cold, and others by different degrees of heat.

Mr. Quist and others have constructed tables of the hardness of different substances. And the manner of constructing these tables was by observing the order in which they were able to cut or make any impression upon one another. The following table, extracted from Magellan's edition of Cronstedt's Mineralogy, was taken from Quist, Bergman, and Kirwan. The first column shews the hardness, and the second the specific gravity.

Diamond from Ormus	20	—	3·7
Pink diamond -	19	—	3·4
Bluish diamond -	19	—	3·3
Yellowish diamond	19	—	3·3
Cubic diamond -	18	—	3·2
Ruby -	17	—	4·2
Pale ruby from Brazils	16	—	3·5
Ruby spinell -	13	—	3·4
Deep blue sapphire	16	—	3·8
Ditto paler	17	—	3·8
Topaz	15	—	4·2
Whitish topaz - -	14	—	3·5
Bohemian ditto - -	11	—	2·8
Emerald - -	12	—	2·8
Garnet -	12	—	4·4
Agate - -	12	—	2·6
Onyx - -	12	—	2·6
Sardonyx - -	12	—	2·6
Occid amethyst - -	11	—	2·7
Crystal - - -	11	—	2·6
Carnelian - -	11	—	2·7
Green jasper - -	11	—	2·7
Reddish yellow ditto -	9	—	2·6
Schoerl - -	10	—	3·6
Tourmaline - -	10	—	3·0
Quartz - -	10	—	2·7
Opal - -	10	—	2·6
Chrysolite - -	10	—	3·7
Zeolyte - -	8	—	2·1
Fluor - -	7	—	3·5
Calcareous spar - -	6	—	2·7
Gypsum - -	5	—	2·3
Chalk - -	3	—	2·7

See, farther, Haüy's Natural Philosophy, vol. i. page 38.

HARDOUIN (John), a learned French Jesuit in the beginning of the 18th century, known by the remarkable paradoxes he advanced in his writings; this in particular, that all the works of the ancient profane writers, except Cicero's works, Virgil's Georgics, Horace's satires and epistles, and Pliny's natural history, are mere forgeries. He died at Paris in 1729, aged 83. His principal works are, 1. An edition of Pliny's natural history, with notes, which is much esteemed. 2. An edition of the Councils, which made much noise. 3. Chronology restored by medals, 4to. 4. A Commentary on the New Testament, folio; in which he pretends that our Saviour and his apostles preached in Latin, &c.

HARDS. *s.* The refuse or coarser part of flax.

HA'RDSHIP. *s.* (from *hard.*) 1. Injury; oppression (*Swift*). 2. Inconvenience; fatigue (*Sprat*).

HA'RDWARE. *s.* (*hard* and *ware.*) Manufactures of metal.

HA'RDWAREMAN. *s.* A maker or seller of metalline manufactures (*Swift*).

HARDWICKE (Philip Yorke, earl of), a great English lawyer, was born at Dover in Kent, in 1690. In 1718 he was elected into parliament for Lewes in Sussex, and in 1720 was appointed solicitor-general. In the same year he was made attorney-general, which office he discharged with great candour and lenity. In 1733 he was appointed lord chief justice of the king's-bench, and created a peer. On the decease of lord Talbot, in 1736, he was called to the office of lord chancellor, which he held twenty years. In 1754 he was created earl of Hardwicke. His lordship died in 1764. In all his offices, particularly the last lord Hardwicke distinguished himself in such a manner as to acquire the esteem of all parties, and the veneration of posterity.

HA'RDY. *a.* (*hardi*, French.) 1. Bold; brave; stout; daring (*Bacon*). 2. Strong; hard; firm (*South*). 3. Confident; impudent; viciously stubborn.

HARE and HERE, differing in pronunciation only, signify both an army and a lord.

HARE. *s.* (hana, Saxon.) In natural history, See LEPUS and HYRUS.

HARE (Java). See MUS.

HARE (Francis), an English prelate, was educated at Eton school, and King's college, Cambridge, of which he was chosen fellow. He was afterwards made dean of Worcester, from whence he was raised to the bishopric of Chichester, which he held, with the deanery of St. Paul's, to his death, in 1740. This bishop wrote against Dr. Hoadly, in the famous Bangorian controversy: he also edited Terence's comedies, and published the book of Psalms, reduced to a metrical order. But his notions on the Hebrew metre were afterwards refuted by bishop Lowth.

To HARE. *v. n.* (*harier*, French.) To fright; to hurry with terror (*Locke*).

HARE-BELL, in botany. See HYACINTHUS.

HARE-BRAINED. *a.* (from *hare*, the verb, and *brain.*) Volatile; unsettled; wild (*Bacon*).

HARE'S EAR, in botany. See BUPLEURUM.

HARE'S EAR (Bastard). See PHYLLIS.

HARE-HUNTING, a well known field sport, of high antiquity, and said by its amateurs to have existed for nearly three thousand years antecedently to the christian æra. Such sporting paleologists, however should first overcome the difficulty of proving that Nimrod, the mighty hunter to whom they refer, was acquainted with the hare or the harrier, neither of which would be very easy: and it is probable that the task would not be much facilitated, if they were to limit the origin of the sport to the epoch of Esau, who is also referred to by them. However, from the reference to it by Xenophon, there can be no doubt that it has a real claim to remote antiquity.

Hare-hunting, though universal in every part of England, Ireland, Scotland, and Wales, is in the highest estimation in those open and champaign counties where, for want of covert, a stag or fox is never seen. Here the hares are stouter, more accustomed to long nightly exercise, more frequently disturbed, more inured to severe courses before greyhounds, and hard runs before hounds; and consequently, calculated to afford much better sport than can be expected in either an inclosed or woodland country. There are three varieties of the hound, with which this particular chase is pursued, according to the soil and natural face of the district. The large, slow, southern hound adapted to the low, swampy, marshy lands, so conspicuous in many parts of Lancashire, Norfolk, and some other counties bordering the sea. The small, busy, indefatigable beagle, appropriated by nature to those steep, hilly, and mountainous parts, where it is impossible for the best horse and boldest rider to keep constantly with the hounds: and the hounds now called harriers, and originally produced by a cross between the southern hound and the dwarf fox; which are only fitted to succeed in those open countries, where, for want of covert, the hare goes five or six miles an end without a turn; as is frequently the case in many parts of Oxfordshire, Northamptonshire, Wiltshire, and Hampshire, constituting chases sometimes superior to those of fox hounds, when hunting beechen coverts and woodland districts.

Hare-hunting is the most common of all our hunts; but there is less fire, and incident, less energy and activity, and far less power of showing a capital hunter to advantage than in stag or fox-hunting: and hence our boldest sportsmen are seldom hare-hunters by inclination. Such, Mr. Beckford, the most scientific sportsman of the day, assures us has ever been his own feeling upon the subject: adding, however, at the same time, that he respects hunting in whatever shape it appears; that it is a manly and wholesome exercise, and seems by nature designed to be the amusement of a Briton. He is of opinion that more than twenty couple of hounds should never be brought into the field; supposing it difficult for a greater number to run well together; and a pack of harriers can never be complete that runs otherwise. He thinks too that the fewer hounds we have, the less we foil the ground, which sometimes proves a hindrance to the chase.

Custom has greatly varied the hour of commencing this diversion within the last thirty years. Before this period the hounds left the kennel at day-light, took trail upon being thrown off, and soon went up to their game; and finding it by their own instinct, they pursued it with the more determined alacrity; a brace or leash of hares were then killed, and the sport of the day concluded by the hour it is now the fashion for the company to take the field. As the trail of a hare lies both partially and imperfectly when the sport opens late in the day, so the difficulty of finding is increased, in proportion to the lateness of the hour at which the hounds are thrown off; hence it is that hare-finders, but little known formerly, are now become truly instrumental to the sport of the day. Yet although the services of the hare-finder are welcome to the eager and expectant sportsman, it is on all hands admitted that they are prejudical to the discipline of the hounds; for having such assistance, the latter become habitually idle and wild; expecting the game to be readily found for them, they seem indifferent to the task of finding it for themselves. Hounds of this description know the hare-finder as well as they know the huntsman, and will not only, upon sight, set off to meet him, but have their heads continually thrown up in the air, in expectation of a view Halloo!

Well-managed packs are quietly brought up to the place of meeting; and when thrown off, a general silence should prevail, that every hound may be permitted to do his own work. Hounds well bred, and well broken to their business, seldom want assistance. Officious intrusions do more harm than good: nothing requires greater judgment or nicer observation in speaking to a hound, than to know the critical time when a word is wanting.

Whenever a hare is turned out of her form, or jumps up before the hounds, the loud and general shout that too frequently prevails not unfrequently breaks off the hare's intended course, and she is headed, or turned into the body of the hounds to certain death; when, on the contrary, were she permitted to go off with less alarm, and to break view without being so closely pressed at starting, there is no doubt that much better runs would be more generally obtained. Individual emulation, again, too frequently occasion horsemen in hare-hunting to be too near the hounds; which being naturally urged by the rattling of the

horses, and the exulting zeal of the riders, are apt at times to over-run the scent, and have no alternative but to turn and divide amidst the legs of the horses, as soon as they find that they have lost it; and to this circumstance may be justly attributed many of the long and tedious faults which so frequently occur, and render this kind of chase the less attracting.

Gentlemen who keep harriers vary much in their modes of hunting them; but the true sportsman never deviates from the strict impartiality of the chase. If a hare be found sitting, and the hounds too near at hand, they are immediately drawn off, to prevent her being chopped in her form: the hare is then silently walked up by the individual who previously found her, and is permitted to go off at her own pace, and to take her own course. The hounds are then drawn over the spot whence she started, where taking the scent, they go off in a style of uniformity, constituting what may be fairly termed the beauty of the chase. Others there are who can never resist the temptation of giving the hounds a view, and never fail to tell you both hare and hounds run the better for it. In addition to this humane method of beginning the chase, every advantage is taken of the poor affrighted animal's distress, amidst all its little instinctive efforts for the preservation of life. The hounds, instead of being permitted to run the foil, and kill the hare by dint of their own persevering labour, are constantly capped from chase to view; and the object of the sport is most wantonly and illiberally destroyed.

When hounds come to a check, not a horse should move, not a voice be heard: every hound should be eagerly employed, exerting all his powers for a recovery of the scent, in which, if not officiously obstructed, they will most probably soon succeed. "When in the field," says Mr. Becket, "I never desire to hear any other tongue than a hound's." Whenever assistance to hounds is become unavoidably necessary, and the chase cannot be carried on without, sound judgment and experience are necessary to speedy success. Casts cannot be made by any fixed, certain, or invariable rules, but must, at different times, be differently dependent upon the chase, the soil, the weather, and the kind of country you are hunting in. It may, in one instance, be prudent to try forward first; in another, to try back; as it may be judicious, or necessary, to make a small circular cast at one time, and a much larger at another; and although to one of the field circumstances may appear, in either instance, to have been nearly the same, yet they may not have been so in the "mind's eye" of the huntsman (or the person hunting the hounds), upon whose superior knowledge or circumspection the good or ill effect of the experiment should depend.

Hare nets: nets for snaring hares. They are of two sorts, one of which, termed gate-nets, has been already described under that name; the other are called purse-nets, and are exactly in the form of cabbage-nets, but of larger and stronger construction, are merely auxiliaries in the same mischief to the gate-net, and are fixed either to the paling or the hedges, at the different meuses through which hares are expected to pass, when the ground has been scoured by a mute lurcher. The success of such villainous poaching is almost certain, and sure of being extensive.

Hare-pipes, instruments so curiously constructed as to imitate the whining whimper of a hare, and formerly in common use among poachers, as a certain mean of drawing the hare within their range. On this account it has been long prohibited by the legislature.

Hare lip, (λαγοχειλος, *Lagocheilus* seu *labia leporina*.) A natural defect in some part of the upper or under lip, so named from some fancied resemblance in the diseased lip to that of an hare. In some the division is large, and a great part of the lip appears to be defective. The fissure is single, double, or complicated; the single has an angular point somewhat like the Roman letter Λ reversed, except that the sides and points are not regular; the double is more inclined to the form of the letter M; the complicated, is when either of the former is attended with a division of the palate on each side, in part, or extending to the back nostrils and uvula, in which case the latter often proves defective.

HARESBURY, a town of Wiltshire, on the Willy, near Warminster, 94 miles from London, is in old records called Heightsbury, or Heytsbury; and now it is written Hatchbury. It was once the seat of the empress Maud. Here are fairs May 14th, and September 15th; and it has sent members to parliament ever since Henry VI. it being an ancient borough by prescription. There is an alms-house here for 12 poor men and a woman. Here is a collegiate church with four prebendaries, and a free school, and the place is governed by a bailiff and burgesses.

HAREWOOD, a small but pretty town in the West Riding of Yorkshire, with a stone bridge of 11 arches over the Wherfe, which runs in a bed of stone, and is as clear as rock-water. Near it are the ruins of a castle which was built soon after the conquest: as also an extensive park and noble house belonging to the family of Lascelles. Lat. 53. 55 N. Lon. 1. 25 W.

HARFLEUR, a town of France, in the department of Lower Seine and late province of Normandy. Its fortifications have been long demolished, and its harbour choked up. It stands at the mouth of the Seine. Lat. 49. 30 N. Lon 0. 19 E.

HA'RIER. *s.* (from *hare.*) A dog for hunting hares (*Ainsworth.*)

HARIOT, or Heriot, in law, a due belonging to a lord at the death of his tenant, consisting of the best beast, either horse, ox, or cow, which he had at the time of his death; and in some manors, the best goods, piece of plate, &c. are called hariots.

There is both hariot-service, and hariot-custom: when a tenant holds by service to pay a hariot at his decease, which is expressly reserved in the deed of feoffment, this is a hariot service; and where hariots have been customarily paid time out of mind after the death of a tenant for life, this is termed hariot custom. For hariot-service, the lord may distrain any beast belonging to the tenant that is on the land. For hariot-custom, the lord is to seize, not distrain; but he may seize the best beast that belonged to the tenant, though

it be out of the manor, or in the king's highway, because he claims it as his proper goods by the death of his tenant. Nevertheless where a woman marries and dies, the lord shall have no hariot-custom, because a feme-covert has no goods to pay as a hariot.

To HARK. *v. a.* (contracted from *hearken.*) To listen (*Hudibras*).

HARK. *interj.* (It is originally the imperative of the verb *hark.*) List! hear! listen! (*Rowe*).

HARK FORWARD!—A shout common among huntsmen to announce that the hounds are a-head, and going on with the chase. It sometimes happens, in very large and thick coverts, that neither man nor horse can be in with the hounds. The best sportsmen are often thrown out for miles, and not unfrequently for the day, by various turns of the chase in covert, and by breaking up the wind on a contrary side, the enthusiastic cry of *hark forward!* however as it is technically pronounced *hoic forward!* relieves their anxiety, and directs them to the right course.

HARL. *s.* 1. The filaments of flax. 2. Any filamentous substance (*Mortimer*).

HARLECH, a town in Merionethshire, with a market on Saturday. It is seated on a rock, on Cardigan Bay, and but a poor place, though the county town, and governed by a mayor. Lat. 52. 54 N. Lon. 4. 6 W.

HARLEIAN COLLECTION. A most valuable collection of useful and curious manuscripts, begun near the end of the last century, by Robert Harley, of Brampton Bryan, Esq. in Herefordshire, afterwards earl of Oxford and lord high-treasurer; and which was conducted upon the plan of the great sir Robert Cotton. He published his first considerable collection in August 1705, and in less than ten years he got together near 2500 rare and curious MSS. Soon after this, the celebrated Dr. George Hicks, Mr. Anstis garter king at arms, bishop Nicolson, and many other eminent antiquaries, not only offered him their assistance in procuring MSS. but presented him with several that were very valuable. Being thus encouraged to perseverance by his success, he kept many persons employed in purchasing MSS. for him abroad, giving them written instructions for their conduct. By these means the MSS. library was, in the year 1721, increased to near 6000 books, 14,000 original charters, and 500 rolls. On the 21st of May, 1724, lord Oxford died: but his son Edward, who succeeded to his honours and estate, still farther enlarged the collection; so that when he died, June 16th, 1741, it consisted of 8000 volumes, several of them containing distinct and independent treatises, besides many loose papers which have been since sorted and bound up in volumes; and above 40,000 original rolls, charters, letters patent, grants, and other deeds and instruments of great antiquity. The principal design of making this collection was the establishment of a MS. English historical library, and the rescuing from destruction such national records as had eluded the diligence of preceding collectors: but lord Oxford's plan was more extensive; for his collection abounds also with curious MSS. in every science. This collection is now in the British Museum; and an enumeration of its contents may be seen in the Annual Register, vol. vi. p. 140, &c.

HARLEM. See HAERLEM.

HARLEQUIN, in the Italian comedy, a buffoon, dressed in party-coloured clothes; answering much the same purpose as a merry-andrew or jack-pudding in our drolls, on mountebanks' stages, &c. We have also introduced the harlequin upon our theatres; and this is one of the standing characters in the modern grotesque or pantomime entertainments. The term took its rise from a famous Italian comedian who came to Paris under Henry III. and who frequenting the house of M. de Harlay, his companions used to call him Harlequino, q. d. little Harlay; a name which has descended to all those of the same rank and profession

HARLESTON, a town in Norfolk, with a market on Wednesdays. It is seated on the river Waveney. Lat. 52. 26 N. Lon. 1. 20 E.

HARLEY (Robert), earl of Oxford and Mortimer, was the eldest son of sir Edward Harley, and born in 1661. At the Revolution, sir Edward and his son raised a troop of horse at their own expence; and after the accession of king William and queen Mary he obtained a seat in parliament. His promotions were rapid: in 1702 he was chosen speaker of the house of commons; in 1704 he was sworn of queen Anne's privy council, and the same year made secretary of state; in 1706 he acted as one of the commissioners for the treaty of union; and in 1710 was appointed a commissioner of the treasury, and chancellor and under-treasurer of the exchequer. A daring attempt was made on his life, March 8, 1711, by the marquis of Guiscard, a French papist; who, when under an examination before a committee of the privy council, stabbed him with a penknife. Of this wound, however, he soon recovered; and was the same year created earl of Oxford, and lord high-treasurer, which office he resigned just before the queen's death. He was impeached of high treason in 1715, and committed to the Tower; but was cleared by trial, and died in 1724. His character has been variously represented, but cannot be here discussed. He was not only an encourager of literature, but the greatest collector in his time of curious books and MSS, his collection of which makes a capital part of the British Museum.

HARLING, a town in Norfolk, with a market on Tuesdays. It has a manufactory of linen cloth. Lat. 52. 27 N. Lon. 0. 58 E.

HARLINGEN, a large and populous seaport of Friesland, in the United Provinces. Lat. 53. 9 N. Lon. 5. 14 E.

HA'RLOT. *s.* (*herlodes*, Welsh, a girl.) A whore; a strumpet (*Dryden*).

HA'RLOTRY. *s.* (from *harlot.*) 1. The trade of a harlot; fornication (*Dryden*). 2. A name of contempt for a woman (*Shak.*).

HARLOW, a small town in Essex, whose market is disused. It is 23 miles N. E. of London. On a common two miles from the town is a famous annual fair on the 9th of September, for horses, cattle, &c. called *Harlow Bush Fair*.

HARM. *s.* (heapm, Saxon.) 1. Injury; crime; wickedness. 2. Mischief; detriment; hurt (*Swift*).

To HARM. *v. a.* To hurt; to injure (*Wal.*).

HARMATTAN, the name given to a singular wind which blows periodically from the interior parts of Africa towards the Atlantic ocean. It prevails in December, January, and February, and is generally accompanied with a fog or haze that conceals the sun for whole days together. Extreme dryness is the characteristic of this wind: no dew falls during its continuance, which is sometimes for a fortnight or more. The whole vegetable creation is withered, and the grass becomes at once like hay. The natives take the opportunity which this wind gives them of clearing the land by setting fire to trees and plants in this their exhausted state. The dryness is so extreme that household furniture is damaged, and the wainscot of the rooms flies to pieces. The human body is also affected by it, so as to cause the skin to peel off, but in other respects it is deemed salutary to the constitution, by stopping the progress of infection, and curing almost all cutaneous diseases.

For a more detailed account of this wind, see Mr. Norris's paper in vol. lxxi. of the Philosophical Transactions.

HARMER (Thomas), a very able dissenting minister and biblical critic, was born at Norwich in 1715. The christian ministry among the dissenters was the object of his own choice; and after a course of preparatory studies, under the direction of Mr. Eames, he settled, at the age of 20, with a small congregation of the independent denomination at Wattesfield, Suffolk, over which he presided till his death, Nov. 27th, 1788. He appears to have been not only an industrious student, but a pious and diligent minister, and a most exemplary member of civil society. Dr. Symonds says, "there is not probably a single "instance of an individual to be found, who, "by a mild and seasonable interference, pre- "vented more law-suits than Mr. Harmer." He is most known by the public for his truly valuable Observations on various Passages of Scripture; a work in which he has very happily pursued the idea of employing the accounts of modern travellers in the East to illustrate the incidents and allusions that occur in scripture. This is a very fertile species of evidence in favour of the christian religion. The fourth edition of Mr. Harmer's work, with many important additions and corrections by Dr. Adam Clarke, was published in 1808, in 4 vols. 8vo.

HA'RMFUL. *a.* (*harm* and *full.*) Hurtful; mischievous (*Raleigh*).

HA'RMFULLY. *ad.* (from *harmful.*) Hurtfully; noxiously (*Ascham*).

HA'RMFULNESS. *s.* (from *harmful.*) Hurtfulness; mischievousness; noxiousness.

HA'RMLESS. *a.* (from *harm.*) 1. Innocent; innoxious; not hurtful (*Shakspeare*). 2. Unhurt; undamaged (*Raleigh*).

HA'RMLESSLY. *ad.* Innocently; without hurt; without crime (*Walton*).

HA'RMLESSNESS. *s.* Innocence; freedom from tendency to injury or hurt (*Donne*).

HARMONIA, in fabulous history, a daughter of Mars and Venus, who married Cadmus. Vulcan, to revenge the infidelity of her mother, made her a present of a vestment dyed in all sorts of crimes, which inspired all the children of Cadmus with impiety. (*Paus.*)

HARMONIA, (αρμονια, from αρω, to fit together). Harmony. A species of synarthrosis, or immoveable connexion of bones, in which bones are connected together by means of rough margins, not dentiform: in this manner most of the bones of the face are united together.

HARMONICA. See ARMONICA.

HARMONIC, as an adjective, signifies in general any thing belonging to harmony; though in our language the adjective is more properly written *harmonical*. In this case it may be applied to the harmonical divisions of a monochord; or, in a word, to consonances in general. As a substantive neuter, it imports all the concomitant or accessary sounds which, upon the principles resulting from the experiments made on sonorous bodies, attend any given sound whatever, and render it appretiable.

HARMONICAL CURVE, a fancied kind of curve, into which it was supposed a musical chord would be inflected when it was put into such a vibratory motion as excited sound. It has been asserted by Dr. Brook Taylor, and others, that if a chord be inflected into any other form than that of the harmonic curve, it will, since those parts which are without this figure are impelled towards it by an excess of force, and those within it by a deficiency, in a very short time arrive at or very near the form of this precise curve. But, as Dr. T. Young very properly remarks, "it would be easy to prove, if this reasoning were allowed, that the form of the curve can be no other than that of the axis, since the tending force is continually impelling the chord towards this line. Phil. Trans. 1800. pt. 1. In theory a musical chord is conceived to be a mathematical line, flexible by the least force, and elastic; and when such chord at the limit of its vibration assumes the form of this harmonical curve, it will vibrate to and fro in curves of the same species. According to the investigation of Dr. Smith, the figure contained under the harmonical curve and its base, is of the same species as the FIGURE *of sines*. From the investigation it follows: 1. That the force by which any small particle of an elastic string is impelled towards the centre of its curvature, is to the tending force, as the length of the particle, to the radius of curvature. 2. The

perpendicular distance of a particle from the string in its quiescent position, is to the string's length, as the same length to the radius of curvature into the square of 3.14159. Hence, if any perpendicular distance DH be put $= d$, the string's length $= L$, $3.14159 = p$, we shall have the radius of curvature at $D = \frac{LL}{dp^2}$.

3. Each particle of the string will arrive at the axis at the same instant of time. But it is all along supposed that the greatest distance of the string from the axis bears no sensible proportion to its length. Smith's Harmon. pa. 248. &c. Notes to Jesuit's Newton, tom. ii. pa. 348.

HARMONICAL PROPORTION, or MUSICAL PROPORTION, is that in which the first term is to the third, as the difference of the first and second is to the difference of the 2d and 3d; or when the first, the third, and the said two differences, are in geometrical proportion. Or, four terms are in harmonical proportion, when the 1st is to the 4th, as the difference of the 1st and 2d is to the difference of the 3d and 4th. Thus, 2, 3, 6, are in harmonical proportion, because 2 : 6 : : 1 : 3. And the four terms 9, 12, 16, 24 are in harmonical proportion, because 9 : 24 : : 3 : 8.—If the proportional terms be continued in the former case they will form an harmonical progression, or series.

1. The reciprocals of an arithmetical progression are in harmonical progression; and, conversely, the reciprocals of harmonicals are arithmeticals. Thus, the reciprocals of the harmonicals 2, 3, 6, are $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{6}$, which are arithmeticals; for $\frac{1}{2} - \frac{1}{3} =$ and $\frac{1}{3} - \frac{1}{6} = \frac{1}{6}$ also: and the reciprocals of the arithmeticals 1, 2, 3, 4, &c. are $\frac{1}{1}$, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, &c. which are harmonicals; for $\frac{1}{1} : \frac{1}{3} : : \frac{1}{1} - \frac{1}{2} : \frac{1}{2} - \frac{1}{3}$; and so on. And, in general, the reciprocals of the arithmeticals a, $a + d$, $a + 2d$, $a + 3d$, &c. viz. $\frac{1}{a}$, $\frac{1}{a+d}$, $\frac{1}{a+2d}$, $\frac{1}{a+3d}$, &c. are harmonicals; et e contra.

2. If three or four numbers in harmonical proportion be either multiplied or divided by some number, the products, or the quotients, will still be in harmonical proportion. Thus,

the harmonicals -	6, 8, 12,
multiplied by 2 give	12, 16, 24,
or divided by 2 give	3, 4, 6,

which are also harmonicals.

3. To find a harmonical mean proportional between two terms: Divide double their product by their sum.

4. To find a 3d term in harmonical proportion to two given terms: Divide their product by the difference between double the 1st term and the 2d term.

5. To find a 4th term in harmonical proportion to three terms given: Divide the product of the 1st and 3d by the difference between double the 1st and the 2d term.

Hence, of the two terms a and b;

the harmonical mean is $\frac{2ab}{a+b}$,

the 3d harmonical propor. is $\frac{ab}{2a-b}$,

also to a, b, c, the 4th harm. is $\frac{ac}{2a-b}$.

6. If there be taken an arithmetical mean, and a harmonical mean, between any two terms, the four terms will be in geometrical proportion. Thus, between 2 and 6,

the arithmetical mean is 4, and
the harmonical mean is 3;
and hence 2 : 3 : : 4 : 6.

Also, between a and b,

the arithmetical mean is $\frac{a+b}{2}$ and

the harmonical mean is $\frac{2ab}{a+b}$,

but $a : \frac{2ab}{a+b} : : \frac{a+b}{2} : b$.

7. Although a series of numbers in DECREASING geometrical progression can never exceed a determinable finite number; yet this is not the case with a decreasing harmonical progression: for it is demonstrable that the series 1, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, &c. may be continued in such a manner as to exceed any finite number whatever.

HARMONICS, as the term is now understood, open a wide field for investigation. Formerly the relations of sounds had only been considered in the series of numbers, 1 : 2, 2 : 3, 3 : 4, 4 : 5, &c. which produced the intervals called octave, fifth, fourth, third, &c. M. Sauveur first considered them in the natural series, 1, 2, 3, 4, &c. and examined the relations of the sounds arising therefrom. The result is, that the first interval, 1 : 2, is an octave; the second, 1 : 3, a twelfth; the third, 1 : 4, a fifteenth, or double octave; the fourth, 1 : 5, a seventeenth; the fifth, 1 : 6, a nineteenth, &c. This new consideration of the relations of sounds is more natural than the old one: it expresses and represents the whole of music, and is, in effect, all the music that nature gives without the assistance of art: for numerous experiments prove clearly, that these relations are not merely theoretic, but exist actually in nature. In addition to what has been said under the articles CHORD and GENERATOR, we may now advance other proofs of these harmonical combinations; in the sound of large bells, for instance, one who listens attentively will distinguish not only the fundamental tone, but the twelfth, and seventeenth major, and sometimes other concords. If a sounding body of any kind, as a rod of

iron, a poker, a piece of thick wire, a flat piece of brass, &c. be hung from a string, one end of which is brought to our ear, and the body struck upon by any proper object, we shall not only hear a loud fundamental sound, but a surprising combination of various tones, in which an attentive ear will distinguish several of the natural harmonics. Again, if we adjust several strings to the octave, the twelfth, and the seventeenth, of the determinate sound emitted by another string, both ascending and descending; as often as we make that which gives the determinate sound to resound strongly, we shall immediately see all the rest put themselves in a state of vibration: we shall even hear those sound which are tuned lower, if we take care to damp or stifle suddenly the sound of the former by the application of a soft body. Experiments nearly similar have been tried upon glasses and other sounding bodies. Now, it is natural to enquire, whether these harmonics have their source immediately in the sonorous body, or exist in the air, or the organ of hearing. Philosophers of eminence have endeavoured to discover whether, independently of the total vibrations made by a body, there are partial ones; but hitherto this has not been totally decided. M. Despiau is of opinion that these harmonical sounds are either in the air or the organ: both suppositions he thinks are probable; for "since a determinate sound has the property of putting into a state of vibration bodies disposed to give its octave, its twelfth, &c. we must allow that this sound may put in motion the particles of the air, susceptible of vibrations of double, triple, quadruple, and quintuple velocity. What however appears most probable in this respect is, that these vibrations exist only in the ear: it seems indeed to be proved by the anatomy of this organ, that sound is transmitted to the soul only by the vibrations of those nervous fibres which cover the interior part of the ear; and as they are of different lengths, there are always some of them which perform their vibrations isochronous to those of a given sound. But, at the same time, and in consequence of the property above mentioned, this sound must put in motion those fibres susceptible of isochronous vibrations, and even those which can make vibrations of double, triple, quadruple, &c. velocity." *Philos. Amusements*, p. 213.

It must be observed, however, that Dr. T. Young is of a contrary opinion, and that the fact adduced by him (see ELASTIC STRING) tends very greatly to confirm the sentiments he has advanced.

HARMONICS, on the German flute and other wind instruments, are produced by increasing the velocity of the air, or blowing with greater and greater degrees of strength: thus, if the degrees of force wherewith the air is impelled through the instrument be as 1, 2, 3, 4, 5, and 6, the corresponding sounds will be the generating sound, the octave, twelfth, fifteenth, seventh, and nineteenth.

HARMO'NIOUS. *a.* (*harmonieux*, Fr.) 1. Adapted to each other; having the parts proportioned to each other (*Cowley*). 2. Musical; symphonious (*Dryden*).

HARMO'NIOUSLY. *ad.* 1. With just adaptation and proportion of parts to each other (*Bentley*). 2. Musical; with concord of sounds (*Stillingfleet*).

HARMO'NIOUSNESS. *s.* (from *harmonious.*) Proportion; musicalness.

To HA'RMONIZE. *v. a.* (from *harmony.*) To adjust in fit proportions (*Dryden*).

HA'RMONY. *s.* (ἁρμονια; *harmonie*, Fr.) 1. The just adaptation of one part to another (*Bacon*). 2. Just proportion of sound (*Watts*). 3. Concord; correspondent sentiment (*Milt.*).

HARMONY, in music, the agreeable result of an union of several musical sounds, heard at one and the same time; or, the mixture of divers sounds, which together have an agreeable effect to the ear. The word is ἁρμονια, formed of the verb ἁρμοζειν, *convenire*, *congruere*, to agree, quadrate, match, &c. As a continued succession of musical sounds produces melody; so does a continued combination of them produce harmony.

HARMONY is either natural or artificial. Natural harmony is such as results from the relations of the concomitant sounds which attend any given fundamental tone. Artificial harmony is such a just and judicious combination of the graver and acuter sounds, as approaches most nearly to the natural harmonic generation of agreeable intervals. The rules which are now made use of in order to render harmony compatible with itself, or to produce such a union of pleasing melodies as shall, when heard together, accord with the experimental principles of modulation, are too complex and multifarious to be comprised within narrow bounds. We shall, therefore, omit them, rather than render them obscure by abridgment; and proceed to explain the different acceptations which have been generally given to the term harmony by practical musicians.

Harmony is divided into simple and compound; simple is that where there is no concord to the fundamental above an octave, the ingredients of simple harmony are the seven simple original concords, of which there can be but eighteen different combinations that are harmony, as may be seen in the following table:

Fifth, octave . .	2
Fourth, octave . .	3
Sixth greater, octave .	3
Third greater, octave .	4
Third lesser, octave .	5
Sixth lesser, octave .	5
Third greater, 5th .	4
Third lesser, 5th .	10
Fourth, 6th greater .	3
Third greater, 6th greater	12
Third lesser, 6th lesser	5
Fourth, 6th lesser .	15
Third greater, 5th .	1
Third, lesser, 5th .	

Fourth, 6th greater . .	Oct.
Third greater, 6th greater . .	Oct.
Third lesser, 6th lesser .	Oct.
Fourth lesser, 6th lesser .	Oct.

The octave is composed of a fifth and fourth, or a sixth and third, which have a variety of greater and less; out of these are the first six harmonics composed: then the fifth being composed of the greater third and less third, and the sixth of the fourth and third; from these arise the next six of the table, then an octave, joined to each of these six, make the last six. Of the first six in the table each has an octave, and their preference is according to their perfection of the other lesser concord joined to the octave. In the next six the preference is given to the two combinations with the fifth, whereof that which has the third greater is best; then to these two combinations with the sixth greater, of which that which has the fourth is best. The last six are not placed last as the least perfect, but as the most complex, being the mixtures of the preceding twelve.

Compound harmony adds to the simple harmony of one octave that of another octave. The variety of this is easily found out of the combinations of the simple harmonies of several octaves. Harmony may also be divided into that of concords, where nothing but these are admitted; and into that of discords, where they are mixed with the concords.

Besides these, we have only to notice figured harmony, or that in which, for the purpose of melody, one or more of the parts of a composition move during the continuance of a chord, through certain notes which do not form any of the constituent parts of that chord: in this species considerable judgment is required.

Harmony of the spheres, or Celestial harmony, a sort of music much talked of by many of the ancient philosophers and fathers, supposed to be produced by the sweetly tuned motions of the stars and planets. This harmony they attributed to the various proportionate impressions of the heavenly globes upon one another, acting at proper intervals. It is impossible, according to them, that such prodigious large bodies, moving with so much rapidity, should be silent: on the contrary, the atmosphere, continually impelled by them, must yield a set of sounds proportionate to the impression it receives; consequently, as they do not all run the same circuit, nor with one and the same velocity, the different tones arising from the diversity of motions, directed by the hand of the Almighty, must form an admirable symphony or concert. They therefore supposed, that the moon, as being the lowest of the planets, corresponded to *mi*; Mercury to *fa*; Venus to *sol*; the Sun to *la*; Mars to *si*; Jupiter to *ut*; Saturn to *re*; and the orb of the fixed stars, as being the highest of all, to *mi*, or the octave. See Plin. lib. ii. cap. 22; Kepler's Harmonics; and Maclaurin's View of Newton's Discoveries, book i. c. 2.

Harmony (Pre-established), a celebrated system of M. Leibnitz, by means whereof he attempts to account for the union or communication between the soul and the body. A soul, or spirit, he observes, is to have a certain series of thoughts, desires, and wills; a body, which is only a machine, is to have a certain series of motions, to be determined by the combination of its mechanical disposition with the impressions of external objects. If, now, there be found a soul and a body so framed, that the whole series of wills of the soul, and the whole series of motions of the body, exactly correspond; and at the same time, for instance, when the soul desires to go to any place, the two feet move mechanically that way; this soul and body will have a relation to one another, not by any actual union between them, but by the constant and perpetual correspondence of the several actions of both. Now, God puts together this soul and body, which had such a correspondence antecedent to their union; such a pre-established harmony. And the same is to be understood of all the other souls and bodies that have been or ever will be joined. This curious system the ingenious author extends much farther: as it, though appearing to explain much, in fact explains nothing; it would be ridiculous to waste our time and that of our readers in attempting to refute it.

Harmony, in architecture, agreeable relation between the parts of a building.

HARMOSTES, in antiquity, a magistrate among the Spartans, who superintended the citadels, forts, &c.

HA'RNESS. *s.* (*harnois*, French.) 1. Armour; defensive furniture of war (*Shakspeare*). 2. The traces of draught horses, particularly of carriages of pleasure or state (*Dryden*).

To Ha'rness. *v. a.* (from the noun.) 1. To dress in armour (*Rowe*). 2. To fix horses in their traces (*Hale*).

HARO, Harou, or Harol, in the Norman customs, *clamour de haro* is a cry or formula of invoking the assistance of justice against the violence of some offender, who, upon hearing the word haro, is obliged to desist, on pain of being severely punished for his outrage, and to go with the party before the judge.

HARP, a stringed musical instrument, consisting of a triangular frame, and the chords of which are distended in parallel directions from the upper part to one of its sides. Its scale extends through the common compass, and the strings are tuned by semitonic intervals. It stands erect, and when used is placed at the feet of the performer, who produces its tones by the action of the thumb and fingers of both hands on the strings. That the harp is among the most ancient of musical instruments, the frequent mention of it in scripture, and the splendid account transmitted to us of the Theban harp, both as to the beauty of its decorations and extent of scale, are sufficient evidences. There is some diversity in the structure of harps. That called the triple harp has ninety-seven strings or chords, in three rows,

extending from C in the tenor cliff, to double G in alt, which make five octaves: the middle row is for the semitones, and the two outside rows are perfect unisons. On the bass side, which is played with the right hand, there are thirty-six strings; on the treble side twenty-six; and in the middle row thirty-five strings. There are two rows of pins or screws on the right side, serving to keep the strings tight in their holes, which are fastened at the other end to three rows of pins on the upper side.

The Irish and Welsh practised the harp long before the gammut of Guido was invented; it is, indeed, their national instrument. In England also it was early introduced to general use, and the most ancient poems were sung to it on Sundays and all public festivals.

There are many different opinions respecting the derivation of this word. Some deduce it from *arpi*, others from the Latin *carpo*, others from the German *herp*. But Dr. Hickes and Dr. Johnson say it comes from the Anglo-Saxon *hearpa*; we are inclined to adopt their opinion.

Harp (Bell), a musical stringed instrument, so called from its being generally swung about in performance like a bell. The bell harp is about three feet long; its strings, which are of no determinate number, are of brass or steel wire, distended over the sounding board, fixed at one end, and held at the other by screws. It includes four octaves, and is performed by striking the strings with the thumbs, the right hand playing the treble and the left the bass.

Harp (Æolus's). See Æolus's harp.

To Harp. *v. n.* (*harper*, French.) 1. To play on the harp (*Corinthians*). 2. To touch any passion (*Shakspeare*).

HARPAGINES, in antiquity, were hooks of iron, hanging on the top of a pole, which, being secured with chains to the masts of ships, and then let down with great velocity into the enemy's vessels, caught them up into the air.

HARPE (Jean François de la), a celebrated French poet, dramatist, and critic, was born at Paris, November 20th, 1739. His father, who was a captain of artillery, died while he was young, and left him in a state of extreme poverty. But he was patronized by M. Asselin, principal of the college of Harcourt, who received him among his pupils.

La Harpe commenced his public career in letters by poems called Heroides, which were then much in vogue. The Epistle of Eloise to Abelard, by Colordeau; of Barnavelt to Traman his friend, by Dorat; and that of a monk of La Trappe to the abbé de Rance, by La Harpe, were very popular. The suffrages were at first divided between La Harpe and Dorat. The world gave the palm to the latter, pleased with the tinsel of his style; but men of taste to the former, who was soon the acknowledged conqueror.

These trifles were but the prelude to a nobler success. To a young man who had destined himself to a literary life, two enviable paths were open—the honours of the academy, and those of the theatre. A prize obtained at the French academy, or a successful drama, would remove the first difficulties, admit him into the higher circles, and procure him elevated protectors. La Harpe presented himself with courage, and almost in the same moment, in both, and his first efforts in each were successful. The first topic of eloquence he essayed was his Eulogy on Charles V. king of France. His other most celebrated eulogies were those on Fenelon, Catinat, and Racine; the latter was esteemed his *chef d'œuvre* in these compositions. Among his tragedies, Warwick, Coriolanus, Philoctetes, Barmecides, Johanna of Naples, and Menzicoff, display the most genius.

To render the homage due from him to Voltaire, he wrote a piece, in which, alluding to the universality of his master's talents, he supposes the whole of the Muses in a contest which shall decree the greatest honours to him. This plan, common as it may be, is executed with much delicacy of conception. It will be felt that Melpomene must be distinguished above the rest; and the author here found no difficulty. But what to make Thalia say, was not so easy to conceive. The author has very dexterously withdrawn himself from this embarrassment; the Muse of Comedy contenting herself with observing, "When he visited me, it was for pastime; but I do not pay a homage the less sincere to his merit." This, expressed in elegant poetry, is not one of the smallest beauties of the piece.

M. de la Harpe also wrote a comedy for the inauguration of the new French theatre, intitled, Moliere at the New Theatre. It is distinguished by a native and genuine gaiety, which affords no small reason to believe that our author would have succeeded in comedy had he early attached himself to it.

M. Gaillard, in drawing a parallel between the tragic productions of M. de la Harpe and M. de Dubelloy, gives the preference to the latter for effect, and to the former for style. "I know not (he says), what rank posterity will assign to M. de la Harpe among our dramatic poets: it will not, however, be denied, that his pieces are written in a style superior to any except the fine tragedies of Racine and Voltaire; and how many beauties are supposed in acknowledging that of style!"

M. de la Harpe was himself asked, a little before his death, how he would have spoken of his tragedies in the Cours de Littérature, had it been within his plan to have criticised living authors. He replied, "I would have done myself this justice, to say, that if I have not contributed to the success of the dramatic art, I cannot be accused of accelerating its fall." It is not possible for any one to judge himself with more truth or modesty.

It is some proof of the richness of M. de la Harpe's talents, that, almost always occupied with serious and eloquent discourses, or the grandeur of tragic subjects, he nevertheless could obtain success in lighter productions, usually the fruit of a love of life and society. Among these are two epistles, one to Tasso,

and the other from Horace to Voltaire, written with ease and elegance. We will not pass in review his odes, although some enjoyed reputation in their time. It appears to us that the author did not possess that fire of imagination necessary to success in the ode. But we now quit all the minor productions of M. de la Harpe, to consider another great feature of his literary character. "Let us suppose him stripped (says M. Gaillard), of his other works, his tragedies, his poetry of various kinds, his academical discourses; let him no longer be deemed a poet or orator; let us now view alone the critic:—How great will the space be, how splendid the fame he will yet enjoy in literature! How has he graced and ennobled that function of journalist, which so many before and after him have degraded!"

We are now come to the work which places the seal on the literary reputation of M. de la Harpe, his Cours de Littérature, Ancienne et Moderne, which justly entitles him, in the beginning of the nineteenth century, to the honourable appellation of the French Quintilian! M. Petitot, after having examined and analyzed the plan which Marmontel has adopted for his Elémens de Littérature, continues thus: "The career of M. de la Harpe is more vast and brilliant. He not only labours to give to persons of no great knowledge competent information on the topics of his work, but arrests the attention of the most learned. In his plan, the outline of which alone announces an immense stock of science and learning, he embraces all ages in which literature has flourished. Every celebrated work is analyzed and discussed. The beauties of the several writers are happily displayed, their faults pointed out, with all the ability of the most lively and sound criticism. It is in reading the Cours de Littérature that we behold the peculiar talent he possessed of appreciating the exact value of every work in every species. We feel nothing of that fatigue so natural in the perusal of extensive and laborious productions. M. de la Harpe examines the enormous multitude of subjects belonging to his plan with all the charms of freshness and novelty.

"That which eminently distinguishes M. de la Harpe from other moderns who have treated of literature, is, that he always assumes the tone of the work he criticises; a merit we find in none of the ancients except Cicero, Quintilian, and Longinus. If he speaks of the Iliad, you behold him borrow all the rich colours of the father of poetry to decorate his discourse: the ungracious air of criticism disappears: nothing remains but the effect of one of the sublime works of the human mind on the imagination of a poet. If he treats of Demosthenes and Cicero, all the great interests of Athens and Rome are reproduced under his eloquent pen. If Tacitus is his theme, you are instantly transported to the age of the emperors: you enter into all the mysteries of the dark policy of Tiberius, and tremble at the sight of Nero. Is M. de la Harpe arrived at the age of Francis I. and Louis XIV. he sports with Marot, rises with Malherbe, sheds the sweet perfume of Racine's poetry, reasons with Pascal, imitates the insinuating graces of Fenelon, melts at the touching exhortations of Massillon, and, if he cannot assume all the grandeur of Bossuet, approaches at least, by a more elevated style, the energy and vigour of the greatest of Christian orators."

We shall have no reader who will not participate in our regret that our author did not live to finish so fine a work. There remains indeed little to do to terminate the examination of the poetry of the eighteenth century; but the department of eloquence is scarcely entered upon; and we have nothing of those of history and miscellaneous literature.

At the conclusion of the examination of modern literature, M. de la Harpe proposed to give sufficient details to appreciate the great writers of foreign literature; but this he had not begun. Finally, he intended to dedicate the conclusion of his Cours to the philosophy of the eighteenth century. He had it much at heart to execute this. Some fragments are all that is formed of it. The most remarkable is relative to Rousseau, whom he seems disposed to attack without restraint; and it cannot be dissembled that his animosity to that eloquent writer is directed rather against his personal character, than what is reprehensible in his works. In the chapter respecting philosophers, he contrasts them with sophists; and it is here that he employs all the vigour of his logic. We are deprived, by the incomplete state of this article, of a subject of great interest, because he had to attack authors of the highest rank in literature and science. It is sufficient to name Voltaire, Rousseau, Condorcet, and Mably, to give an idea of the extent of the task M. de la Harpe had here imposed on himself.

He left behind him, in manuscript, a Commentary on the tragedies of Racine, and another on those of Voltaire.

The qualities which distinguish M. de la Harpe as a writer, are, an immense erudition; a mind nourished by a love of the fine models of antiquity, and of the great writers of the age of Louis XIV.; the art of identifying himself with his subject; a colouring that may be almost felt; luminous views; a clearness of expression, resulting from the distinct and natural order of his ideas; a style vigorous and impressive in criticism, and eloquent in discourse; and, above all, the vehemence of his pen when inspired by indignation. When thus moved, he seizes upon the avenues of passion by his delineation of injustice; he overwhelms by accumulation of proof, by the rapidity of his arguments; or renders opposition ridiculous by the keenness of his irony.

It would be natural to suppose that M. de la Harpe must have secluded himself almost entirely from the world in order to execute so many literary enterprizes; but we learn the contrary from himself. He was much in company, and his visits were eagerly courted. Doubtless he owed the favour in which he was with polite circles to his early and brilliant

success in letters, which at once balanced the prejudices created by the unfortunate adventure of his youth, and the resentment often excited by the severity of his criticisms. From the first essay of his talents he was patronized by Voltaire and D'Alembert, who were at the head of literature and sciences; and it is well known what influence those two celebrated men possessed over the public opinion. Voltaire accorded him the enviable title of his favourite pupil. Married, while yet very young, to a woman of wit and beauty, madame de la Harpe and he mutually shone with unusual brilliancy in the most fashionable assemblies.

M. de la Harpe, graced with the personal favour of sovereign princes, and covered with literary honours, inherited after the death of Voltaire part of the renown of that great man; and when Rousseau, D'Alembert, and afterwards Buffon, and other persons of distinguished merit died, he occupied, almost without a rival, one of the first ranks in the republic of letters. All eyes seemed then to be turned upon him, to console themselves for the losses they had sustained. He had arrived at the moment of receiving the fruit of all his labours. The public esteem was expressed loudly when the administrators of the Lyceum appointed him to deliver the lectures of that institution; and this school of taste became the most distinguished theatre of his glory. The magnitude and importance of the course of lectures he had undertaken, and the infirm state of his health, now induced him to dedicate himself wholly to that labour, to which he in fact had confined himself for several years preceding the Revolution. That terrible moment arrived; and in vain did M. de la Harpe endeavour to attract still to the Lyceum the numerous partizans of literature. At this memorable epoch he participated, with other well-disposed minds, sentiments the most unequivocally formed for the happiness of his country; but he continued in the discharge of his literary functions, and would accept of no public office. He has been reproached with not having foreseen the dreadful march of the progressive horrors we have since beheld. What innocent man could have foreseen them? He has been reproached also with changing his opinion. Who is there that has not modified his during these unhappy convulsions? Can any one raise his voice to say, that M. de la Harpe ever applauded these horrors; he who would have arrested the torrent; he, in a word, who, for having unmasked the ferocious madness of Robespierre, was thrown into a dungeon, where long he remained between the living and the dead, uncertain each hour to which he should belong? It was there that he had leisure to groan over the follies of the human race; there, that religion offered to him her happy consolations; there, that he adopted the resolution of consecrating the remainder of his days to her service; and shewing to the world that even he who had been a contemner of Christianity, a ridiculer of its mysteries, and a bosom companion of those who sat "in the chair of the scorner," had been chosen as a monument of mercy, and converted from the error of his way.

La Harpe had the happiness to be forgotten in his prison, from which he was liberated shortly after the 9th Thermidor. He re-appeared at the Lyceum, where it was observed that misfortune and piety had added new energy to his eloquence; and it was in the midst of a numerous audience that he boldly and ingenuously renounced his errors!

Scarcely was he restored to his fellow-citizens, than he placed himself courageously as a sentinel to guard against the return of so many calamities. It was this spirit that dictated to him various works respecting projects of laws which had renewed alarms. One of the greatest scourges produced by the general disorder was that gross and ferocious language which began to cast France back with rapid strides towards ages of barbarism. M. de la Harpe repelled the innovators in style with the arms of reason, taste, and eloquence. Ignorance did not pardon that zeal which displayed her in just colours.

A new storm arose, and M. de la Harpe was driven to seek an asylum in a spot impenetrable to all but a faithful friendship. He was deprived of exercise; and the effect on his health was perceptible when he again appeared in public after the 18th Brumaire. His health thenceforth sensibly declined; and he expired on the 11th of February 1803, in his 65th year.

HA'RPER. *s.* (from *harp.*) A player on the harp (*Tickel*).

HARPIES, or HARPYÆ, in antiquity, a fabled kind of winged monsters, daughters of Neptune and Terra, who had the face of a woman, the body of a vulture, and had their feet and fingers armed with sharp claws. They were three in number, Aello, Ocypete, and Celeno. They were sent by Juno to plunder the tables of Phineus, whence they were driven to the islands called Strophades, by Zethes and Calais. They emitted an infectious smell, and spoiled whatever they touched by their filth. They plundered Æneas during his voyage towards Italy, and Celeno predicted many of the calamities which attended him.

HARPING IRON. See HARPOON.

HARPINGS, in a ship, properly denote her breadth at the bow. Some also give the same name to the ends of the bends that are fastened into the stern.

HARPOCRATES, in mythology, the son of Isis and Osiris. This is an Egyptian deity, whose distinguishing attribute is, that he is represented with his fingers applied to his mouth, denoting that he is the god of silence. The statue of this idol was fixed in the entrance of most of the Egyptian temples, and he was commonly exhibited under the figure of a young man naked, crowned with an Egyptian mitre, holding in one hand a cornucopia, and in the other the flower of lotus, and sometimes bearing a quiver.

HARPOON, or HARPING-IRON, a spear

or javelin used to strike the whales in the Greenland fishery. The harpoon, which is sometimes called the harping-iron, is furnished with a long staff, having at one end a broad and flat triangular head, sharpened at both edges, so as to penetrate the whale with facility: to the head of this weapon is fastened a long cord, called the whale line, which lies carefully coiled in the boat, in such a manner as to run out without being interrupted or entangled. See BALÆNA, WHALE-FISHERY.

HARPOON (Gun), a kind of fire-arm for discharging harpoons at whales, and thereby killing them more easily and expeditiously than formerly when the harpoons were thrown by the hand. Though this method was projected a good many years ago, it has but lately come into use; and premiums have been annually offered by the society for encouraging arts, &c. to the persons who first struck a fish in this manner. In the Transactions of that Society for 1786, we have an account of the first fish struck in this manner in 1784. The gun was of the blunderbuss construction, loaded with four common tobacco-pipes full of glazed powder; the fish was shot at the distance of ten fathoms, the harpoon going into her back up to the ring; and she was killed in about an hour. In 1785 three whales were killed in this manner; four in 1786, and three in 1787. Since that time the gun harpoon has come more into use, and will probably soon supersede the other method entirely.

HARPSICHORD, a musical stringed instrument, consisting of a case formed of mahogany or walnut-tree wood, and containing the belly or sounding-board, over which the wires are distended, supported by bridges. In the front the keys are disposed, the long ones of which are the naturals, and the short ones the sharps and flats. These keys being pressed by the fingers, their inclosed extremities raise little upright oblong slips of wood called jacks, furnished with crow-quill plectrums, which strike the wires. This instrument has of late years given place in our drawing-rooms to the piano-forte.

HARPY. See HARPIES.

By an obvious application the term harpy is now often used to denote a ravenous wretch, an extortioner.

HARQUEBUSS, a hand-gun, or a fire-arm of a proper length and weight to be borne in the arm. Hanzelet prescribes its proper length to be 40 calibres, or diameters of its bore; and the weight of its ball 1 oz. and $\frac{7}{8}$; its charge of powder as much.

HA'RQUEBUSSIER. *s.* (from *harquebuss*.) One armed with a harquebuss (*Knolles*).

HARRIDA'N. *s.* (corrupted from *haridelle*, French, a worn-out worthless horse.) A decayed strumpet (*Swift*).

HARRIER, or COMMON HOUND, a variety of the canis familiaris, appropriated solely to the pursuit of the hare, and thence deriving its appellation. Repeated experiments have proved satisfactorily that the best breed of the harrier is obtained from crossing the old southern and the dwarf fox hound. Mr. Beckford, whose opinion is decisive, affirms that his hounds were a cross of both these kinds, in which it was his endeavour to get as much bone and strength, in as small a compass as possible. It was a difficult undertaking. He bred many years, and a great multitude of hounds, before he could get what he wanted, and had at last the pleasure to see them very handsome; small, yet very bony: they ran remarkably well together, and fast enough; had all the alacrity that could be desired, and would hunt the coldest scent. When they were thus perfect, he tells us, he did as many others do—he parted with them. The best pack of harriers existing in the present day is, as it ought to be, that of his majesty. See also BEAGLE and HOUND.

HARRINGTON (James), a most eminent English writer in the seventeenth century, bred at Oxford, travelled into Holland, France, Denmark, and Germany, and learned the languages of those countries. Upon his return to England, he was admitted one of the privy-chamber extraordinary to king Charles I. He served the king with great fidelity, and made use of his interest with his friends in parliament to procure matters to be accommodated with all parties. The king loved his company, except when the conversation happened to turn upon commonwealths. He found means to see the king at St. James's; and attended him on the scaffold, where, or a little before, he received a token of his majesty's affection. After the death of king Charles, he wrote his Oceana; a kind of political romance, in imitation of Plato's Commonwealth, which he dedicated to Oliver Cromwell. It is said, that when Oliver perused it, he declared, that "the gentleman had wrote very well, but must not think to cheat him out of his power and authority; for that what he had won by the sword, he would not suffer himself to be scribbled out of." This work was attacked by several writers, against whom he defended it. Beside his writings to promote republican principles, he instituted likewise a nightly meeting of several ingenious men in the New Palace-yard, Westminster; which club was called the Rota, and continued till the secluded members of parliament were restored by general Monk. In 1661 he was committed to the Tower for treasonable designs and practices; and chancellor Hyde, at a conference with the lords and commons, charged him with being concerned in a plot. But a committee of lords and commons could make nothing of that plot. He was conveyed to St. Nicolas's island, and from thence to Plymouth, where he fell into an uncommon disorder of the imagination. Having obtained his liberty by means of the earl of Bath, he was carried to London, and died in 1677. He published, besides the above works, several others, which were first collected by Toland, in one volume folio, in 1700; but a more complete edition was published, in 1737, by the reverend Dr. Birch.

HARRIOT (Thomas), a celebrated algebraist, was born at Oxford in 1560, where he

was also educated. In 1579 he completed his bachelor's degree; and, being already distinguished for his mathematical learning, was soon after recommended to sir Walter Raleigh as a proper person to instruct him in that science. He was accordingly received into the family of that gentleman; who, in 1585, sent him with the colony, under sir Richard Grenville, to Virginia; of which country, having remained there about a year, he afterwards published a topographical description. About the year 1588 Mr. Harriot was introduced, by his patron sir Walter Raleigh, to Henry Percy earl of Northumberland, who allowed him a pension of a hundred and twenty pounds per annum. He spent many years of his life in Sion college; where he died in July 1621, of a cancer in his lip, and was buried in the church of St. Christopher, where a handsome monument was erected to his memory. Anthony Wood tells us he was a deist, and that the divines looked upon his death as a judgment. Be his religious opinions what they might, he was doubtless one of the first mathematicians of the age in which he lived, and will always be remembered as the inventor of the present improved method of algebraical calculation. His improvements in algebra were adopted by Des Cartes, and for a considerable time imposed upon the French nation as his own invention; but the theft was at last detected, and exposed by Dr. Wallis, in his History of Algebra, where the reader will find our author's invention accurately specified. His works are, 1. A brief and true report of the new-found land of Virginia; of the commodities there found, and to be raised, &c. 2. Artis analyticæ praxis ad æquationes algebraicas nova expedita, et generali methodo resolvendas, e posthumis Thomæ Harriot. 3. Ephemeris Chyrometrica, a manuscript in the library of Sion college. Besides these works, a great number of MSS. composed by Harriot, were found by the able astronomer Dr. Zach of Saxe Gotha, in the year 1784, at the seat of the earl of Egremont, at Petworth in Sussex; they naturally descended into the hands of this nobleman, from a predecessor Henry Percy the noble earl of Northumberland, who was a patron of Harriot and other learned men. From these manuscripts it appears that Harriot was not only a celebrated analyst, but an eminent astronomer, both theoretical and practical: he was the first observer of the solar spots, on which he made a hundred and ninety-nine observations; he also made many excellent observations on the satellites of Jupiter, and indeed it is probable that he discovered them as early, if not earlier than Galileo; he likewise made several observations upon the moon, the planet Mars, the solstices, and comets. His observations of the comet of 1607, says Dr. Zach, "are of the more importance even now for modern astronomy, as this is the same comet that fulfilled Dr. Halley's prediction of its return in the year 1759. That prediction was only grounded upon the elements afforded him by these coarse observations; for which reason he only assigned the time of its return to the space of a year. The very intricate calculations of the perturbations of this comet, afterwards made by M. Clairaut, reduced the limits to a month's space. But a greater light may now be thrown upon this matter by the more accurate observations on this comet by Mr. Harriot. In the month of October 1785, when I conversed upon the subject of Harriot's papers, and especially on this comet, with the very celebrated mathematician M. de la Grange, director of the Royal Academy of Sciences at Berlin; he then suggested to me an idea, which, if brought into execution, will clear up an important point in astronomy. It is well known to astronomers how difficult a matter it is, to determine the mass, or quantity of matter, in the planet Saturn; and how little satisfactory the motions of it are that have hitherto been formed. The whole theory of the perturbations of comets depending upon this uncertain datum, several attempts and trials have been made towards a more exact determination of it by the most eminent geometricians of this age, and particularly by la Grange himself; but never having been satisfied with the few and uncertain data heretofore obtained for the resolution of this problem, he thought that Harriot's observations on the comet of 1607, and the modern ones of the same comet in 1759, would suggest a way of resolving the problem *a posteriori*; that of determining by them the elements of its ellipsis. The retardation of the comet compared to its period, may clearly be laid to the account of the attraction and perturbation it has suffered in the region of Jupiter and Saturn; and as the part of it belonging to Jupiter is very well known, the remainder must be the share which is due to Saturn; from whence the mass of the latter may be inferred. In consequence of this consideration I have already begun to reduce most of Harriot's observations of this comet, in order to calculate by them the true elements of its orbit on an elliptical hypothesis, to complete M. la Grange's idea upon this matter."

We conclude this article with observing, that these papers of Harriot are in a fair train for publication, and will, we hope, ere long make their appearance.

HARRIS (James, Esq.) a very learned English gentleman, was the son of a gentleman of the same name, of the Close, Salisbury, and was born July 20, 1709. He received the earlier part of his education under the reverend Mr. Hill, at the grammar school, Salisbury, and at the age of sixteen was entered as a gentleman commoner at Wadham college, Oxford. From hence he removed to Lincoln's-inn, with a view of making the study of the law a part of his education. When he had reached his twenty-fourth year his father died, and our author immediately retired from London to the family house at the Close of Salisbury, where he applied himself with great avidity to the study of his favourite authors among the Greek and Latin classics. During fourteen or fifteen years his application to the best writers of

antiquity continued to be almost unremitting, and his industry was such as is very seldom exceeded. His first literary production was printed in the year 1744, and contained three treatises; 1st. concerning Arts. 2d. Music, Painting, and Poetry; and 3d. On Happiness. In July 1745, Mr. Harris married a daughter of John Clarke, esq. of Sandford near Bridgewater, by whom he had five children; three of them, viz. James, now earl of Malmsbury, and two daughters, have survived their father. In 1751 he published his elaborate work, Hermes, or A Philosophical Inquiry concerning Universal Grammar. Our opinion of this work coincides with that of the learned bishop Lowth: "Those," says he, "who would enter deeply into the subject of universal grammar, will find it fully and accurately handled, with the greatest acuteness of investigation, perspicuity of explanation, and elegance of method, in a treatise entitled Hermes, by James Harris, esq. the most beautiful example of analysis that has been exhibited since the days of Aristotle." In the year 1761, Mr. Harris obtained a seat in parliament for the borough of Christchurch; this seat he retained to the day of his death.

From 1752 to 1774 he became successively, one of the lords of the admiralty, a lord of the treasury, and secretary and comptroller to the queen: he was very assiduous in the discharge of all his public duties. In 1775, he published another very learned and masterly work entitled Philosophical Arrangements. The last work which proceeded from his pen was his excellent Philological Enquiries, which contains a summary of the conclusions to which the philosophy of the ancients had conducted them in their critical enquiries. Mr. Harris died December 22, 1780, in his 72d year.

This very learned man possessed a profound knowledge of the Greek language, and he applied it, we think, more successfully than any other writer to the study and explanation of ancient philosophy. But his attainments were not confined to ancient philosophy and classical learning: he possessed, likewise, a general knowledge of modern history, with a very distinguishing taste in the fine arts, in one of which, namely music, he was an eminent proficient. His singular industry and talents empowered him to make these various acquisitions without neglecting any of the duties which he owed to his family, his friends, or his country: so that, at the same time that he was admired and revered as a profound philosopher and classic, he was beloved by his family and friends, and entrusted with the discharge of several important offices in the state. His son the earl of Malmsbury has lately published an edition of his works, with an account of his life and character; to which we refer the reader for more particulars.

HARRISBURG, a town of Pennsylvania, capital of the county of Dauphin, situate on the E. branch of the Susquehannah. Lat. 40. 15 N. Lon. 76. 55 W.

HARRISON (John), an ingenious mechanic, was born at Foulby in Yorkshire, in 1693, and bred to his father's business, which was that of a carpenter. Having a turn for wheel work, he constructed some wooden clocks, the accuracy of which was so much admired, that he came to London in 1725, with a timekeeper, which he shewed to Dr. Halley, who recommended him to Mr. Graham, and received great encouragement from him to prosecute his design. In 1735 he visited London again, with a complete machine, and was sent by the board of longitude to Lisbon, to make a trial of its properties. From that time he went on improving his invention, and at length received the reward of twenty thousand pounds allowed by parliament. He died in 1776.

Like many other mere mechanics, Mr. Harrison found a difficulty in delivering his sentiments in writing (at least in the latter periods of his life, when his faculties were much impaired) in which he adhered to a peculiar and uncouth phraseology. This was but too evident in his Description concerning such Mechanism as will afford a nice or true Mensuration of Time, &c. 8vo, 1775. This small work includes also an account of his new musical scale; being a mechanical division of the octave, according to the proportion which the radius and diameter of the circle have respectively to the circumference. He had in his youth been the leader of a band of church-singers; had a very delicate ear for music; and his experiments on sound, with a curious monochord of his own improvement, it has been said were not less accurate than those he was engaged in for the mensuration of time.

HARROGATE, a village in the W. Riding of Yorkshire, three miles W. of Knaresborough. It is famous for three medicinal springs, and particularly for one which is more strongly impregnated with sulphur than any in Great Britain. The season is from May to Michaelmas. The company assemble and lodge in five or six large inns; of which some are at the upper village called High Harrogate, the others at the nether one near the sulphur and chalybeate wells, and called Low Harrogate: the two being nearly a mile asunder.

When first drawn, the water from the sulphur well, which is by way of distinction called the Harrogate water, is transparent, and emits a few air-bubbles. It possesses a strongly fetid sulphureous smell, similar to that of bilge-water; and is of a bitter, nauseous, and strongly saline taste. After being exposed for several hours to the open air, it becomes turbid, assumes a greenish colour, loses its sulphureous smell, and deposits sulphur at the bottom and sides of the vessel.

When first drunk, this water causes a slight giddiness and headach, but is speedily attended with a mild purgative effect, and its laxative properties continue, even after being kept for a moderate length of time.

Harrogate water is used in various disorders of the alimentary canal, and in those affections of the biliary system from which the former

are generated. Its chief internal use, however, is in scrophulous and cutaneous disorders; though it is also of considerable service when applied externally to leprous eruptions, and other obstinate diseases of the skin. It is likewise a safe and often a powerful remedy for the piles, as well as against the round worm and ascarides, if such a quantity be drunk as will prove a brisk purgative. In general, such draughts are taken as will produce a sensible effect on the bowels: for this purpose, three or four glasses, containing somewhat more than half a pint each, should be swallowed in the morning, at moderate intervals. The water ought to be used cold and fresh from the spring, if the stomach can support it. In order to correct the nauseous flavour, Dr. Garnett judiciously advises patients to eat a small portion of sea-biscuit, or coarse bread, instead of taking aromatic seeds, sugar-comfits, &c. By the former expedient, the offensive taste will be speedily removed, and the stomach not be cloyed; a circumstance of the first consequence to invalids.

HA'RROW. *s.* (*charroue*, Fr.) A frame of timbers crossing each other, and set with teeth, drawn over sowed ground to throw the earth over the seed. See HUSBANDRY.

To HA'RROW. *v. a.* (from the noun.) 1. To cover with earth by the harrow (*Tusser*). 2. To break with the harrow (*Shakspeare*). 3. To tear up; to rip up (*Rowe*). 4. To pillage; to strip; to lay waste (*Bacon*). 3. (from heȝgian, Saxon.) To invade; to harass with incursions: obsolete (*Spenser*). 6. To disturb; to put into commotion (*Shakspeare*).

HA'RROW. *interj.* An exclamation of sudden distress; out of use (*Spenser*).

HARROW, a village in Middlesex, on the highest hill in the county, on the summit of which is the church. Here is a celebrated free school, founded by John Lyons in the reign of queen Elizabeth.

HA'RROWER. *s.* (from *harrow.*) 1. He who harrows. 2. A kind of hawk (*Ainsw.*).

To HA'RRY. *v. a.* (*harer*, Fr.) 1. To teaze; to hare; to ruffle (*Shakspeare*). 2. In Scotland it signifies to rob or plunder.

HARSH. *a.* ([illegible], German. *Skinner.*) 1. Austere; rough[illegible] ([illegible]*ham*). 2. Rough to the ear (*Dryden*). 3. Crabbed; morose; peevish (*Taylor*). 4. Rugged to the touch; rough (*Boyle*). 5. Unpleasing; rigorous (*Dryden*).

HA'RSHLY. *ad.* 1. Sourly; austerely to the palate. 2. With violence; not gently (*Milton*). 3. Severely; morosely; crabbedly (*Addison*). 4. Unpleasantly to the ear (*Shakspeare*).

HA'RSHNESS. *s.* (from *harsh.*) 1. Sourness; austere taste (*Bacon*). 2. Roughness to the ear (*Pope*). 3. Ruggedness to the touch (*Bacon*). 4. Crabbedness; peevishness (*Shakspeare*).

HART, in natural history, an obsolete term for stag. (See CERVUS). It has long been disused among sportsmen, but still exists in our forest law

HART-ROYAL. A stag hunted in former times by king or queen, and which had proved victorious in the chase. In conjunction with this titular honour, he also obtained the superior privilege of perfect freedom, proclamation being made through the towns and villages adjoining the spot where he had escaped that no farther molestation or attempt on his life should take place, and that he should be allowed to return in safety to his native chase, or forest. Several instances, however, have occurred in modern times which too fully prove that this ancient privilege is no longer held sacred.

HARTFELL WATER. A chalybeate water, which has been found particularly serviceable in disorders of the stomach and bowels, bloody flux, bloody urine, immoderate flow of the menses, or their suppression, fluor albus, gleets, &c. It has also been applied externally to old and languid ulcers.

HARTFORD, a commercial town of Connecticut, in the United States of America. Lat. 41. 50 N. Lon. 72. 35. W.

HARTFORD. See HERTFORD.

HARTLAND, a town in Devonshire, with a market on Saturdays. It is seated on the Bristol Channel. Lat. 51. 12 N. Lon. 4. 31 W.

HARTLEPOOL, a seaport in the county of Durham, with a market on Mondays. Lat. 54. 47 N. Lon. 1. 4 W.

HARTLEY, a seaport of England, on the east coast of the county of Northumberland, with a good and convenient harbour, in which vessels may lie secure. The exports in the year 1776 were 70,000 dozen bottles, 300 tons of salt, and 100 tons of copperas manufactured in the place, 18,000 chaldrons of coals: twelve miles N.E. of Newcastle-upon-Tyne.

HARTLEY (David), was born at Ilingworth, where his father was curate; he received his academical education at Jesus college, Cambridge, of which he was a fellow. He first began to practise physic at Newark, in Nottinghamshire; from whence he removed to St. Edmund's Bury, in Suffolk. After this he settled for some time in London; and lastly went to live at Bath, where he died in 1757, aged 53, leaving two sons and a daughter. He published a View of the present Evidence for and against Mrs. Stephen's Medicine as a Solvent for the Stone, containing 155 Cases, with some Experiments and Observations; London, 1739. He is said to have also written against Dr. Warren, of St. Edmund's Bury, in Defence of Inoculation; and some letters of his are to be met with in the Philosophical Transactions. But his most considerable literary production is a work intitled, Observations on Man, his Frame, his Duty, and his Expectations, in two parts; London, 1749, 2 vols. 8vo. The first part contains observations on the frame of the human body and mind, and on their mutual connections and influences. The second part contains observations on the duty and expectations of mankind.

The philosophical character of Dr. Hartley

s delineated in his last mentioned work, the features of his private and personal character were of the same complexion. His thoughts were not immersed in worldly pursuits or contentions, and therefore his life was not eventful or turbulent, but placid and undisturbed by passion or violent ambition. Indeed, he appeared to have subdued all his vices, and to be himself entirely under the dominion of reason and religion: he was lively and sociable in his disposition, benevolent and kind in his conduct, and his whole deportment, as well as his great work on Man, clearly evince that he entertained the most profound reverence for the Supreme Being, at the same time that he enjoyed all those consolations which the Gospel imparts: for this philosopher also was an unfeigned believer in the great truths of Revelation, at the same time that he avoided every important doctrinal error, except that which respects the limited duration of future punishment.

HARTOGIA. In botany, a genus of the class tetrandria, order monogynia. Petals four, spreading; calyx five-cleft; drupe ovate; nut two-seeded. A tree of the Cape, with oblong, obtuse, serrate, glabrous leaves; flowers axillary, minute, peduncled.

HARTSHORN. See CORNU CERVI.

HARTSHORN SHAVINGS. Rasura cornu cervi. See CORNU CERVI.

HARTSHORN (Salt of). See CARBONAT OF AMMONIA.

HARTSOEKER (Nicholas), a Dutch philosopher, born at Gouda, in 1656. After receiving a liberal education under his father, who was a minister among the remonstrants, he applied himself assiduously to mathematics and natural philosophy, and became so eminent that Peter the Great invited him to Moscow, but he declined the honour. He became professor of philosophy at Heidelburg, and mathematician to the elector Palatine. He died in 1725. Hartsoeker wrote a Course of Natural Philosophy, in 4to, and some small pieces.

HARTWORT (Shrubby), in botany. See BUPLEURUM.

HARTZGERODE, a town of Upper Saxony, in the principality of Anhalt Bernburg, situate near a mountain called the Hartz mountain. Lat. 51. 46 N. Lon. 11. 2 E.

HA'RVEST. *s.* (hærfest, Saxon.) 1. The season of ripening and gathering the corn (*L'Estrange*). 2. The corn ripened, gathered, and inned (*Shakspeare*). 3. The product of labour (*Dryden*).

HARVEST-HOME. *s.* 1. The song which reapers sing at the feast made for having inned the harvest (*Dryden*). 2. The time of gathering harvest (*Dryden*). 3. The opportunity of gathering treasure (*Shakspeare*).

HARVEST-LORD. *s.* The head reaper at the harvest (*Tusser*).

HARVEST MOON. See MOON.

HA'RVESTER. *s.* (from *harvest.*) One who works at the harvest.

HA'RVESTMAN. *s.* A labourer in harvest.

HARVEY (William), a celebrated English physician, was born at Folkstone in 1578. He received his academical education at Cambridge, and then went to Padua in Italy, where he took his doctor's degree in physic, and on his return to England was incorporated M. D. at Cambridge. In 1607 he was admitted fellow of the college of physicians, and in 1615 anatomical reader there, on which occasion he discovered the circulation of the blood, of which he published an account in 1628, entitled, Exercitatio Anatomica, de Motu cordis et sanguinis. This discovery made a great revolution in the science of physic, and many foreign practitioners endeavoured to rob the author of his due honour, by ascribing it to other persons, and among the rest to father Paul of Venice. But the right of our learned countryman has long since been fully established. In 1632 he was made physician to Charles I. and adhered faithfully to the king in the civil wars, who in 1645 got him chosen warden of Merton college, Oxford; but when the parliamentary visitors came there, he left it and went to London, where he was chosen president of the college, which office, on account of his infirmities, he declined. He died in 1657, leaving his estate to the college, for which he had before built a library, museum, and a combination-room. A handsome edition of his works was printed in 1766, in 2 vols. 4to. (*Watkins*).

HARUSPEX, a soothsayer at Rome, who drew omens by consulting the entrails of beasts that were sacrificed. He received the name of *Aruspex, ab aris aspiciendis*, and that of *Extispex, ab extis inspiciendis*. The order of Aruspices was first established at Rome by Romulus. The first Aruspices were Tuscans, who received all their knowledge from a boy named Tages, who, as was commonly reported, sprang from a clod of earth. (Vid. TAGES.)—For a minute description of the office of the Aruspices, and the manner in which they collected the omens, &c. the young student is referred to Lempriere's Dictionary, or Kennet's Antiquities.

HARWICH, a seaport town of England, in the county of Essex, situated at the mouths of the Stour and Orwell, where they unite and form a large bay, soon after falling into the German Ocean, by a strait near three miles wide at high water, but not in every part deep enough for ships of burden; the east side is defended by Landguard Fort. Harwich was formerly fortified, but in the reign of Charles I. the fortifications were demolished. It is not large, but populous, and being the chief port for packets to Holland, is a place of considerable trade, and many vessels are employed in the North sea fishery; and the harbour, independent of the bay, is safe and convenient. Here is a very good dock-yard for building ships; and great conveniences for sea-bathing both hot and cold. It is a borough town, and sends two members to the British parliament; and is governed by a mayor and aldermen.

Here are two markets weekly, on Tuesday and Friday; and in time of peace packets sail regularly, if wind and weather do not prevent, every Wednesday and Saturday, with the mail to Helvoetsluys. Lat. 52. 0 N. Lon. 1. 25 E.

HARWOOD (Edward), a dissenting minister of considerable learning, was born in Lancashire in 1729. He was pastor of a congregation at Bristol, from whence he was obliged to remove, on account of his violence in the Arian controversy. He then removed to London, where he subsisted by teaching the classics, and correcting the press. He died in 1794. Dr. Harwood published a great number of books and pamphlets, and among the rest a translation of the New Testament, and a View of the various editions of the Greek and Roman classics.

To HASH. *v. n.* (*hacher*, Fr.) To mince; to chop into small pieces and mingle (*Garth*).

HASK. *s.* This seems to signify a case or habitation made of rushes or flags (*Spenser*).

HASLEMERE, a small borough in Surrey, with a market on Tuesdays. Lat. 51. 6 N. Lon. 0. 38 W.

HA'SLET. HA'RSLET. *s.*(*hasla*, Islandick, a bundle; *hastier*, Fr.) The heart, liver, and lights of a hog, with the windpipe and part of the throat to it.

HASLINDEN, a town in Lancashire, with a market on Wednesdays. Lat. 53. 40 N. Lon. 2. 16 W.

HASP. *s.* (hæpp, Saxon.) A clasp folded over a staple, and fastened on with a padlock (*Mortimer.*)

To HASP. *v. n.* (from the noun.) To shut with a hasp.

HASSELQUIST (Frederick), a Swedish physician, was born in 1722, at Tournalla, in East Gothia, and educated at Upsal, where he attended the botanical lectures of Linnæus, after which he went to Palestine, and collected a great number of natural curiosities, but died at Smyrna, on his return in 1752. Linnæus arranged and published his observations.

HASSELQUISTIA, in botany, a genus of the class pentandria, order digynia. Flowers radiate; florets of the circumference hermaphrodite; those of the centre male; seeds of the circumference double, with a crenate margin; those of the centre solitary, pitcher-shaped, hemispherical. Two species, herbaceous plants of Arabia and Egypt.

HA'SSOCK. *s.* (*huzeck*, German.) A thick mat or cushion, on which persons kneel at church.

HAST, the second person singular of *have*.

HASTA, among medallists, a kind of spear, not shod or headed with iron; or rather an ancient sceptre, the symbol of the goodness of the gods.

HASTATE LEAF. In botany, a leaf resembling the head of a halbert. Triangular, hollowed at the base, and on the sides, with the angles spreading.—Exemplified in rumex and scutellaria hastifolia.

HASTE. *s.* (*haste*, Fr.) 1. Hurry; speed; nimbleness; precipitation (*Dryden*). 2. Passion; vehemence (*Psalms*).

To HASTE. *To* HA'STEN. *v. n.* (*haster*, French.) 1. To make haste; to be in a hurry (*Jerem.*). 2. To move with swiftness (*Denham*).

To HASTE. *To* HA'STEN. *v. a.* To push forward; to urge on; to precipitate; to drive a swifter pace (*Dryden*).

HA'STENER. *s.* (from *hasten.*) One that hastens or hurries.

HA'STILY. *ad.* (from *hasty.*) 1. In a hurry; speedily; nimbly; quickly. 2. Rashly; precipitately (*Swift*). 3. Passionately; with vehemence.

HA'STINESS. *s.* (from *hasty.*) 1. Haste; speed. 2. Hurry; precipitation (*Sidney*). 3. Rash eagerness (*Dryden*). 4. Angry testiness; passionate vehemence.

HA'STINGS. *s.* (from *hasty.*) Peas that come early (*Mortimer*).

HASTINGS, a town of England, in the county of Sussex, and the first of those called the Cinque Ports; said to have been so called from one Hastings, a Dane, who landed here to pillage the country, and built a fort to secure his retreat. The harbour, formerly of considerable consequence, is now only an indifferent road for small vessels, having been ruined by storms, like the port of Winchelsea. As chief of the Cinque-Ports, it was obliged to provide twenty-one vessels for the king's service, on forty days' notice, with provisions, arms, and men, fit for warlike service, and continue a fortnight at their own charge; if at the end of that time their farther service was required, the expences were defrayed by the crown. Hastings contains three parishes, but only two churches; the number of houses is about 600, and the inhabitants estimated at 3000. This port received charters from Edward the Confessor, William I. Charles II. and several other of our kings; and have sent members to the British parliament ever since the reign of Edward III. There is a considerable fishery carried on here, particularly herrings and mackarel, and several hoys trade regularly, to and from London. There are two markets weekly, on Wednesday and Saturday. Lat. 50. 52 N. Lon. 0. 46 E.

HA'STY. *a.* (*hastif*, French.) 1. Quick; speedy (*Shakspeare*). 2. Passionate; vehement (*Proverbs*). 3. Rash; precipitate (*Eccles.*) 4 Early ripe (*Isaiah*).

HASTY-PUDDING. *s.* A pudding made of milk and flower, boiled quick together.

HAT, a covering for the head, worn by men throughout the western part of Europe. Hats are said to have been first seen about the year 1400, at which time they became of use for country wear, riding, &c. F. Daniel relates, that when Charles II. made his public entry into Rouen, in 1449, he had on a hat lined with red velvet, and surmounted with a plume or tuft of feathers: he adds, that it is from this entry, or at least under this reign, that the use of hats and caps is to be dated,

which henceforward began to take place of the chaperons and hoods that had been worn before. In process of time, from the laity, the clergy also took this part of the habit; but it was looked on as a great abuse, and several regulations were published, forbidding any priest or religious person to appear abroad in a hat without coronets, and enjoining them to keep to the use of chaperons, made of black cloth, with decent coronets; if they were poor, they were at least to have coronets fastened to their hats, and this upon penalty of suspension and excommunication. Indeed the use of hats is said to have been of a longer standing among the ecclesiastics of Brittany, by two hundred years, and especially among the canons; but these were no other than a kind of caps, and from hence arose the square caps worn in colleges, &c. Lobineau observes, that a bishop of Dol, in the 12th century, zealous for good order, allowed the canons alone to wear such hats; enjoining, that if any other person come with them to church, divine service should immediately be suspended. Hats make a very considerable article in commerce: the finest, and those most valued, are made of pure hair of an amphibious animal, called the castor or beaver, frequent in Canada and other provinces of North America. See Beaver.

Hat-making, a mechanical process by which wool, hair, fur, and other substances, are formed into the well known covering for the head mentioned in the preceding article.

The best information we have been able to obtain respecting this important subject is given in Mr Nicholson's Philosophical Journal. Our readers will be indebted to this ingenious journalist, and his able correspondent Mr. John Clennell, of Newcastle-upon-Tyne, for whatever instruction they may derive from this article; and as we wish not to deck ourselves in borrowed plumes, we shall communicate that instruction in the words of its authors.

Having visited the manufactory of Messrs. Collinsons, batters in Gravel-lane, Southwark, Mr. Nicholson gives the following account of their procedure:

"The materials for making hats are rabbits fur cut off from the skin, after the hairs have been plucked out, together with wool and beaver. The two former are mixed in various proportions, and of different qualities, according to the value of the article intended to be made; and the latter our author believes to be universally used for facing the finer articles, and never for the body or main stuff. Experience has shewn, that these materials cannot be evenly and well felted together, unless all the fibres be first separated, or put into the same state with regard to each other. This is the object of the first process, called *bowing*. The material, without any previous preparation, is laid upon a platform of wood, or of wire, somewhat more than four feet square, called a *hurdle*, which is fixed against the wall of the work-shop, and is enlightened by a small window, and separated by two side partitions from other hurdles, which occupy the rest of the space along the wall. The hurdle, if of wood, is made of deal planks, not quite three inches wide, disposed parallel to the wall, and at the distance of one-fortieth or one-fiftieth of an inch from each other, for the purpose of suffering the dust, and other impurities of the stuff, to pass through; a purpose still more effectually answered by the hurdle of wire.

"The workman is provided with a bow, a bow pin, a basket, and several cloths. The bow is a pole of yellow deal wood, between seven and eight feet long, to which are fixed two bridges, somewhat like that which receives the hair in the bow of the violin*. Over these is stretched a catgut, about one-twelfth part of an inch in thickness. The bow-pin is a stick with a knob, and is used for plucking the bow-string. The basket is a square piece of ozier work, consisting of open strait bars with no crossing or interweaving. Its length across the bars may be about two feet, and its breadth eighteen inches. The sides into which the bars are fixed are slightly bended into a circular curve, so that the basket may be set upright on one of these edges near the right hand end of the hurdle, where it usually stands. The cloths are linen. Besides these implements, the workman is also provided with brown paper.

"The bowing commences by shovelling the material towards the right hand partition with the basket, upon which, the workman holding the bow horizontally in his left hand, and the bow-pin in his right, lightly places the bow-string, and gives it a pluck with the pin. The string, in its return, strikes part of the fur, and causes it to rise, and fly partly across the hurdle in a light open form. By repeated strokes, the whole is thus subjected to the bow; and this beating is repeated till all the original clots or masses of the filaments are perfectly opened and obliterated. The quantity thus treated at once is called a *batt*, and never exceeds half the quantity required to make one hat.

"When the batt is sufficiently bowed, it is ready for *hardening*; which term denotes the first commencement of felting. The prepared material being evenly disposed on the hurdle, is first pressed down by the convex side of the basket, then covered with a cloth, and pressed successively in its various parts by the hands of the workman. The pressure is gentle, and the hands are very slightly moved back and forwards at the same time through a space of perhaps a quarter of an inch, to favour the hardening or entangling of the fibres. (See Felting in this work.) In a very short time, indeed, the stuff acquires sufficient firmness to bear careful handling. The cloth is then taken off, and a sheet of paper, with its corners doubled in, so as to give it a triangular outline, is laid upon the batt, which last is folded over the paper as it lies, and its edges, meeting one over the other, form a conical cap. The joining is soon made good by pressure with the hands on the cloth. Another batt, ready hardened, is in the next place laid on the hurdle, and the cap here mentioned placed upon it, with the joining downwards. This last batt being also

* Mr. Nicholson's correspondent, who is himself a hatter, says, that the bow is best made of ash; that it is composed of the *stang* or handle; that the bridge at the smaller end, or that which is nearest the window in the act of bowing, is called the *cock*; and that the other bridge, which is nearer to the workman's hand, is called the *breech*.

folded up, will consequently have its place of junction diametrically opposite to that of the inner felt, which it must therefore greatly tend to strengthen. The principal part of the hat is thus put together, and now requires to be worked with the hands a considerable time upon the hurdle, the cloth being also occasionally sprinkled with clear water. During the whole of this operation, which is called *basoning**, the article becomes firmer and firmer, and contracts in its dimensions. It may easily be understood, that the chief use of the paper is to prevent the sides from felting together.

"The basoning is followed by a still more effectual continuation of the felting, called *working*†. This is done in another shop, at an apparatus called a *battery*, consisting of a *kettle* (containing water slightly acidulated with sulphuric acid, to which, for beaver hats, a quantity of the grounds of beer is added, or else plain water for rinsing out), and eight *planks* of wood joined together in the form of a frustum of a pyramid, and meeting in the kettle at the middle. The outer or upper edge of each plank is about two feet broad, and rises a little more than two feet and a half above the ground; and the slope towards the kettle is considerably rapid, so that the whole battery is little more than six feet in diameter. The quantity of sulphuric acid added to the liquor is not sufficient to give a sour taste, but only renders it rough to the tongue. In this liquor, heated rather higher than unpractised hands could bear, the article is dipped from time to time, and then worked on the planks with a roller, and also by folding or rolling it up, and opening it again; in all which, a certain degree of care is at first necessary, to prevent the side from felting together; of which, in the more advanced stages of the operation, there is no danger. The imperfections of the work now present themselves to the eye of the workman, who picks out knots and other hard substances with a bodkin, and adds more felt upon all such parts as require strengthening. This added felt is patted down with a wet brush, and soon incorporates with the rest. The beaver is laid on towards the conclusion of this kind of working. Mr. Nicholson could not distinctly learn why the beer grounds were used with beaver-hats. Some workmen said, that by rendering the liquor more tenacious, the hat was enabled to hold a greater quantity of it for a longer time; but others said, that the mere acid and water would not adhere to the beaver facing, but would roll off immediately when the article was laid on the plank. It is probable, as he observes, that the manufacturers who now follow the established practice, may not have tried what are the inconveniences this addition is calculated to remove."

Our author's correspondent, however, assigns several reasons for the addition of those dregs, which, he says, ought to be thick, and the sourest that can be got. 1. Vitriol (sulphuric acid) would harden the hat too much, which is kept mellow by the dregs. 2. The dregs are said by the workmen to hold or fill the body, whilst a little vitriol cleanses it of the dirt, &c. that may be on the rabbit or other wools. 3. Another advantage attending the use of dregs, whether of beer, porter, or wine, is, that as the boiling of the dying does not draw out much of the mucilage from each hat when it comes to be stiffened, the dregs form a body within the hat, sufficiently strong or retentive to keep the glue from coming through amongst the nap. 4. Vitriol (sulphuric acid) alone purges or weakens the goods too much, consequently half of the quantity does better with the addition of dregs, as it allows the body to be made closer by more work.

Of these four reasons for the use of dregs, the last alone appears to us perspicuous or at all satisfactory. But be this as it may, acid of some kind gives a roughness to the surface of the hair, which facilitates the mechanical action of felting; and Mr. Collinson informed Mr. Nicholson, that in a process, called *carotting*, they make use of nitrous acid. In this operation, the material is put into a mixture of the nitrous and sulphuric acids in water, and kept in the digesting heat of a stove all night; by which means the hair acquires a ruddy or yellow colour, and loses part of its strength.

"It must be remembered, that our hat still possesses the form of a cone, and that the whole of the several actions it has undergone have only converted it into a soft flexible felt, capable of being extended, though with some difficulty, in every direction. The next thing to be done is to give it the form required by the wearer. For this purpose, the workman turns up the edge or rim to the depth of about an inch and a half, and then returns the point back again through the centre or axis of the cap, so far as not to take out this fold, but to produce another inner fold of the same depth. The point being returned back again in the same manner, produces a third fold; and thus the workman proceeds, until the whole has acquired the appearance of a flat circular piece, consisting of a number of concentric undulations or folds, with the point in the centre.

* Mr. Nicholson's correspondent says, that after bowing, and previous to the basoning, a *hardening skin*, that is, a large piece of skin, about four feet long and three feet broad, of leather alumed or half tanned, is pressed upon the hat, to bring it by an easier gradation to a compact appearance; after which it is basoned, being still kept upon the hurdle. This operation, the basoning, derives its name from the process or mode of working, being the same as that practised upon a wool hat after bowing; the last being done upon a piece of cast metal, four feet across, of a circular shape, called a *bason*: the joining of each batt is made good here by shuffling the hand, that is, by rubbing the edges of each batt folded over the other to excite the progressive motion of each of the filaments in felting, and to join the two together. Many journeymen, to hurry this work, use a quantity of vitriol (sulphuric acid), and then, to make the nap rise and flow, they kill the vitriol, and open the body again by throwing in a handful or two of oatmeal; by this means they get a great many made, though, at the same time, they leave them quite grainy from the want of labour. This, in handling the dry grey hat when made, may be in part discovered; but in part only.

† The intelligent writer, who has been so often quoted, says, that before this operation is begun, the hat is dipped into the boiling kettle, and allowed to lie upon the plank until cold again; this is called *soaking*, that is, being perfectly saturated with the hot liquor: if they are put in too hastily in this state, for they are then only bowed and basoned, they would burst from the edges, each batt not being sufficiently felted into the other.

This is laid upon the plank, where the workman, keeping the piece wet with the liquor, pulls out the point with his fingers, and presses it down with his hand, at the same time turning it round on its centre in contact with the plank, till he has, by this means, rubbed out a flat portion equal to the intended crown of the hat. In the next place he takes a block, to the crown of which he applies the flat central portion of the felt, and by forcing a string down the sides of the block, he causes the next part to assume the figure of the crown, which he continues to wet and work, until it has properly disposed itself round the block. The rim now appears like a flounced or puckered appendage round the edge of the crown; but the block being set upright on the plank, the requisite figure is soon given by working, rubbing, and extending this part. Water only is used in this operation of fashioning or blocking; at the conclusion of which it is pressed out by the blunt edge of a copper implement for that purpose.

"Previous to the dyeing, the nap of the hat is raised or loosened out with a wire brush, or carding instrument. The fibres are too rotten after the dyeing to bear this operation. The dyeing materials are logwood, and a mixture of the sulphates of iron and of copper, known in the market by the names of green copperas and blue vitriol. As the time of Mr. Collinson was limited, and my attention, says Mr. Nicholson, was more particularly directed to the mechanical processes, I did not go into the dye-house; but I have no doubt that the hats are boiled with the logwood, and afterwards immersed in the saline solution. I particularly asked whether galls were used, and was answered in the negative.

"The dyed hats are, in the next place, taken to the stiffening shop. One workman, assisted by a boy, does this part of the business. He has two vessels, or boilers, the one containing the grounds of strong beer, which costs seven shillings per barrel, and the other vessel containing melted glue, a little thinner than it is used by carpenters. Our author particularly asked, whether this last solution contained any other ingredient besides glue, and was assured that it did not. The beer grounds are applied in the inside of the crown to prevent the glue from coming through to the face, and also, as he supposes, to give the requisite firmness at a less expence than could be produced by glue alone. If the glue were to pass through the hat in different places, it might, he imagines, be more difficult to produce an even gloss upon the face in the subsequent finishing. The glue stiffening is applied after the beer grounds are dried, and then only upon the lower face of the flap, and the inside of the crown. For this purpose, the hat is put into another hat, called a stiffening hat, the crown of which is notched, or slit open in various directions. These are then placed in a hole in a deal board, which supports the flap, and the glue is applied with a brush.

"The dry hat, after this operation, is very rigid, and its figure irregular. The last dressing is given by the application of moisture and heat, and the use of the brush, and a hot iron, somewhat in the shape of that used by tailors, but shorter and broader on the face. The hat being softened by exposure to steam, is drawn upon a block, to which it is securely applied by the former method of forcing a string down from the crown to the commencement of the rim. The judgment of the workman is employed in moistening, brushing, and ironing the hat, in order to give and preserve the proper figure. When the rim of the hat is not intended to be of an equal width throughout, it is cut by means of a wooden, or perhaps metallic pattern; but as no such hats are now in fashion, Mr. Nicholson saw only the tool for cutting them round. The contrivance is very ingenious and simple. A number of notches are made in one edge of a flat piece of wood for the purpose of inserting the point of a knife, and from one side or edge of this piece of wood there proceeds a strait handle, which lies parallel to the notched side, forming an angle somewhat like that of a carpenter's square. When the legs of this angle are applied to the outside of the crown, and the board lies flat on the rim of the hat, the notched edge will lie nearly in the direction of the radius, or line pointing to the centre of the hat. A knife being therefore inserted in one of the notches, it is easy to draw it round by leaning the tool against the crown, and it will cut the border very regular and true. This cut is made before the hat is quite finished, and is not carried entirely through; so that one of the last operations consists in tearing off the redundant part, which by that means leaves an edging of beaver round the external face of the flap. When the hat is completely finished, the crown is tied up in gauze paper, which is neatly ironed down. It is then ready for the subsequent operations of lining," &c.

Our author concludes his valuable memoir on the fabrication of hats, with some observations on the probable gain or loss of employing machinery in the manufacture. These observations, as they are stated in the original paper, we recommend to the serious attention of every judicious hat-maker, who carries on his business on a large scale; for he will find them not the reveries of a rash speculatist, but the cool reflections of a real philosopher, who is at the same time no stranger to the arts of life. They suggest the following subjects of enquiry; Whether carding, which is rapidly and mechanically done, be inferior to bowing, which does not promise much facility for mechanical operation? Whether a succession of batts or cardings might be thrown round a fluted cone, which rapidly revolving, in contact with three or more cylinders, might perform the hardening, and even the working, with much more precision and speed than they are now done by hand? Whether blocking or shaping be not an operation extremely well calculated for the operation of one or more machines? Whether loose weaving and subsequent felting might not produce a lighter, cheaper, and stronger article? And how far the mechanical felting, which is not confined merely to the hairs of animals, might be applied to this art?

Before we dismiss this subject, it may be worth while to state Mr. Dunnage's method of making *water-proof hats*, in imitation of beaver, for which, in November 1794, he obtained a patent. It is as follows: Let a shag be woven, of such count in the reed, and cut over such sized wire, as will give the hats to be manufactured from it that degree of richness, or appearance of fur, which may be thought necessary. The materials of which this shag may be composed are various, and should be accommodated to different kind of hats, according to the degree of beauty and durability to be given them, and the price at which they are designed to be sold; that is to say, silk, mohair, or any other hair that is capable of being spun

into an end fine enough for the purpose, cotton, inkle, wool, or a mixture of any, or all the above materials, as may suit the different purposes of the manufacturer. Those answer best (says our author,) which are made with two poles, either of Bergam, Piedmont, or Organzine silk, rising alternately, in a reed of about nine hundred count to eighteen inches wide, with three shoots over each wire. This method of weaving distributes the silk (as it may be put single into the harness), and prevents any ribby appearance which it might have if the silk were passed double, and the whole of the pole cut over each wire. This may be made either on a two or four thread ground of hard silk, shot with fine cotton, which he thinks preferable for shoot, to silk, inkle, or any other material, as it forms both a close and fine texture. An inferior kind of hats may be made from any of the before-mentioned materials, and with cheaper silk. This shag should be stretched on a frame, such as dyers use to rack cloth; then (having previously set the pile upright with a comb, to prevent its being injured or stuck together), go over the ground with thin size, laid on with a soft brush. For black, or dark colours, common size will do; with white, or any light colour, use isinglass, or a size made from white kid leather. These, or gum, or any other mucilaginous matter, which, without altering the colour, will prevent oil from getting through the ground so as to injure the pile, will answer the purpose. Take care not to apply more of any material, as a preparation, than may be fully saturated with oil or varnish, so that water will not discharge it from the ground. The size, or other glutinous matter, being dry, the pile must be teaseled, or carded with a fine card, till the silk is completely taken out of the twist or throwing, when it will lose its coarse shaggy look, and assume the appearance of a very fine fur. It must now be once more set upright with a comb, and you may proceed to lay on your water-proof material; this too may be varied according to circumstances. For black, or any dark colour, linseed oil well boiled with the usual driers, and thickened with a small quantity of any good drying colour, will do; for white, or very fine colours, poppy or nut oil, or copal or other varnishes, may be used. In this particular the manufacturer must judge what will best answer his purpose, taking care never to use any thing that will dry hard, or be subject to crack. Mr. Dunnage has found good drying linseed oil preferable to any other thing which he has used, and, with the precaution of laying on very little the first time, it will not injure the finest colours. When the first coat of oil is dry, go over it a second and a third time, if necessary, till you are convinced the pores of the ground are fully closed up, and the stuff rendered impervious to water. It should now stand several days, till the smell is sufficiently gone off; and before it is taken from the frame, should be gone over with some ox gall or lime-water, to take off the greasiness, which would otherwise prevent the stiffening from adhering to the oil. The material being now ready to be formed into hats, should be cut into proper shapes for that purpose. The crown should be made up over a block, with needle and silk, the oiled side outwards. The seams should then be rubbed with a piece of hard wood, bone, or ivory, to make them lie flat, and the edges of the stuff pared off very near the stitches, that no joint may appear on the right side. The seams should then be carefully gone over with the prepared oil, till every crevice or hole made by the needle is completely filled up, and the crown rendered perfectly water-proof. The crown may then be turned and stiffened, by sticking linen, leather, paper, or any other material that may be found to answer the purpose, to the inner or painted side, till it acquires about the same degree of stiffness, or resistance to the touch, as a good beaver. The mucilaginous matter which he used to attach the stiffening to the crown, and the upper and under parts of the brim to each other, was composed of one pound of gum arabic or senega, one pound of starch, and half a pound of glue, boiled up with as much water as reduced the whole to the consistence of a thick paste. A greater or less proportion of any of these ingredients may be used, and other glutinous and adhesive substances may answer the same purposes; or drying oils may be made use of, instead of this or other mucilage; or any of the resinous gums dissolved in oil or spirits; only it should be observed, in this case, the hats will require more time in the preparation, as the oily matter, unless exposed to the air, will not readily dry; but he found by experience that the above-mentioned composition does not dry hard or brittle, but retains that pleasant flexibility which is agreeable to the touch, while it communicates to the other materials a sufficient degree of elasticity. Before the brim is perfectly dry, care should be taken to form a neck or rising round the hole where it is to be attached to the crown, by notching it round with a pair of scissars, and then forcing it over a block something larger than you have made the hole, so that the uncut stuff may turn up, under the lower edge of the crown, about a quarter of an inch. Before you join the crown and brim together, go over the outside of the neck of the brim, and the inside of the crown, as high as the neck will come (which should be about half an inch), with the prepared oil; and when they are nearly dry, so as to adhere to the finger on touching them, put the crown over the neck of the brim, and let them be sewed strongly together, taking care to sew down as little of the pile as possible, and using the same precaution of oiling, where the needle has been through, as was observed in making up the crown. The hat is now ready for dressing; which operation may be performed over a block, with a hot iron, brush, &c. in the same manner as those commonly called felts. When putting in the lining, be very careful to let the needle only take hold of the under surface of the brim; for should it perforate the upper one, the water will find its way through, and the hat be of no value. Though we have already declared how little we are acquainted with the operation of hat-making, we cannot help suggesting the enquiry, whether these water proof hats might not be improved both in strength and beauty, by a slight felting before the application of the size by the brush. Such of them as are composed of wool or hair, or contain a mixture of these materials, are unquestionably susceptible of felting.

HATS are also made for women's wear, of chips, straw, or cane, by platting, and sewing the plats together; beginning with the centre of the crown, and working round till the whole is finished. Hats for the same purpose are also wove and made of horse-hair, silk, &c. See STRAW HAT.

HATBAND. *s.* (*hat* and *band.*) A string tied round the hat (*Bacon*).

HATCASE. *s.* (*hat* and *case.*) A slight box for a hat (*Addison*).

To HATCH. *v. a.* (*hecken*, German.) 1. To produce young from eggs (*Milton*). 2. To quicken the egg by incubation (*Addison*). 3. To produce by precedent action (*Hooker*). 4. To form by meditation; to contrive. 5. (from *hacher*, French, *to* cut.) To shade by lines in drawing or graving (*Dryden*).

To HATCH. *v. n.* 1. To be in a state of growing quick (*Boyle*). 2. To be in a state of advance toward effect.

HATCH. *s.* (from the verb.) 1. A brood excluded from the egg. 2. The act of exclusion from the egg. 3. Disclosure; discovery (*Shakspeare*). 4. (heca, Saxon.) A half door (*Shakspeare*). 5. (In the plural.) The doors or openings by which they descend from one deck or floor of a ship to another (*Dryden*). 6. *To be under* HATCHES. To be in a state of ignominy, poverty, or depression (*Locke*).

To HATCHEL. *v. a.* (*hachelen*, German.) To beat flax so as to separate the fibrous from the brittle part (*Woodward*).

HA'TCHEL. *s.* (*hachel*, German.) The instrument with which flax is beaten.

HA'TCHELLER. *s.* (from *hatchel.*) A beater of flax.

HATCHET. *s.* (*hache*, *hachette*, French.) A small axe (*Crashaw*).

HATCHET-FACE. *s.* A thin ugly face (*Dry.*)

HATCHET-FORM, in botany. See DOLABRIFORM.

HATCHING, the maturating fecundated eggs, whether by the incubation and warmth of the parent bird, or by artificial heat, so as to produce young chickens alive. For the natural process, see the article ORNITHOLOGY.

The art of hatching chickens by means of ovens has long been practised in Egypt; but it is there only known to the inhabitants of a single village named Berme, and to those that live at a small distance from it. Towards the beginning of autumn they scatter themselves all over the country, where each person among them is ready to undertake the management of an oven, each of which is of a different size, but in general they are capable of containing from forty to fourscore thousand eggs. The number of these ovens placed up and down the country is about three hundred and eighty-six, and they usually keep them working for about six months. As, therefore, each brood takes up in an oven, as under a hen, only twenty-one days, it is easy in every one of them to hatch eight different broods of chickens. Every Bermean is under the obligation of delivering to the person who intrusts him with an oven, only two-thirds of as many chickens as there have been eggs put under his care; and he is a gainer by this bargain, as more than two-thirds of the eggs usually produce chickens. In order to make a calculation of the number of chickens yearly so hatched in Egypt, it has been supposed that only two-thirds of the eggs are hatched, and that each brood consists of at least thirty thousand chickens; and thus it would appear that the ovens of Egypt give life yearly to at least ninety-two millions six hundred and forty thousand of these animals.

This useful and advantageous method of hatching eggs has been employed in France by the ingenious Mr. Reaumur, who, by a number of experiments, reduced the art to certain principles. He found by experience that the heat necessary for this purpose is nearly the same with that marked 32 on his thermometer, or that marked 96 on Fahrenheit's. This degree of heat is nearly that of the skin of the hen, and what is remarkable, of the skin of all other domestic fowls, and probably of all other kinds of birds. The degree of heat which brings about the developement of the cygnet, the gosling, and the turkey-pout, is the same as that which fits for hatching the canary-songster, and, in all probability, the smallest humming-bird: the difference is only in the time during which this heat ought to be communicated to the eggs of different birds: it will bring the canary-bird to perfection in eleven or twelve days, while the turkey-pout will require twenty-seven or twenty-eight.

Mr. Reaumur invented a sort of low boxes, without bottoms, and lined with furs. These, which he calls artificial parents, not only shelter the chickens from the injuries of the air, but afford a kindly warmth, so that they presently take the benefit of their shelter as readily as they would have done under the wings of a hen. After hatching, it will be necessary to keep the chickens for some time in a room artfully heated, and furnished with these boxes; but afterwards they may be safely exposed to the air in the court-yard, in which it may not be amiss to place one of these artificial parents to shelter them if there should be occasion for it.

As to the manner of feeding the young brood, they are generally a whole day after being hatched before they take any food at all; and then a few crumbs of bread may be given them for a day or two, after which they will begin to pick up insects and grass for themselves. But to save the trouble of attending them, capons may be taught to watch them in the same manner as hens do. Mr. Reaumur assures us that he has seen above two hundred chickens at once, all led about and defended only by three or four such capons. Nay, cocks may be taught to perform the same office, which they, as well as the capons, will continue to do all their lives after.

To facilitate the process of hatching, an apparatus called an artificial mother has been recently invented, and the inventor rewarded by the Society of Arts.

HATCHMENT, in heraldry, the marshaling of several coats of arms in an escutcheon.

HATCHMENT is also a popular name for an achievement.

By these hatchments or funeral escutcheons, it may be known after any person's decease what rank either he or she held when living; and if it be a gentleman's hatchment, whether he was a bachelor, married man, or widower,

with the like distinctions for gentlewomen. See HERALDRY.

HATCHWAY. *s.* (*hatches* and *way.*) The way over or through the hatches.

To HATE. *v. a.* (hatian, Saxon.) To detest; to abhor; to abominate (*Shakspeare*).

HATE. *s.* (hate, Saxon.) Malignity; detestation; the contrary to love (*Broome*).

HA'TEFUL. *a.* (*hate* and *full.*) 1. That causes abhorrence; odious (*Peacham*). 2. Abhorrent; detesting; malignant; malevolent (*Dryden*).

HA'TEFULLY. *ad.* 1. Odiously; abominably. 2. Malignantly; maliciously (*Chapman*).

HA'TEFULNESS. *s.* Odiousness.

HA'TER. *s.* (from *hate.*) One that hates; an abhorrer; a detester (*South*).

HATFIELD, or BISHOP'S HATFIELD, a town of England, in the county of Herts. It takes the latter name for having once belonged to the bishops of Ely, who had a palace here, which with the manor became alienated to the crown, in the reign of queen Elizabeth, who occasionally resided here, and was hence conducted to be crowned, at London. Here is a weekly market on Thursday: seven miles W.S.W. of Hertford, and nineteen and a half N. London. Lat 51. 48. N. Lon. 0. 10 W.

HATFIELD BROAD OAK, or HATFIELD REGIS, a town in Essex, with a market on Saturdays. Lat. 51. 48 N. Lon. 0. 20 E.

HATHERLY, a town in Devonshire, with a market on Fridays. Lat. 50. 52 N. Lon. 4. 9 W.

HA'TRED. *s.* (from *hate.*) Hate; ill-will; malignity; abhorrence (*South*).

To HATTER. *v. n.* To harass; to weary; to tire out (*Dryden*).

HA'TTER. *s.* (from *hat.*) A maker of hats.

HATTOCK. *s.* (*attock*, Erse.) A shock of corn.

HATUAN, a town and fortress of Upper Hungary, 28 miles N.E. of Buda. Lat. 47. 44 N. Lon. 18. 54 E.

HAVANNA, a seaport on the N.W. part of the island of Cuba, opposite Florida. It is famous for its harbour, which is so large that it may hold 1000 vessels; and yet the mouth is so narrow that only one ship can enter at a time. This is the place where all the ships that come from the Spanish settlements rendezvous on their return to Spain. It is near two miles in circumference, and, in 1700, was computed to contain 26,000 inhabitants, Spaniards, Mulattoes, and Negroes; a number which must have been considerably increased since. The entrance into the harbour is well defended by forts and platforms of great guns. The buildings are elegant, built of stone, and some of them superbly furnished; and the churches are rich and magnificent. Here is the residence of the governor and captain-general of Cuba, and of the royal officers, as well as of an assessor for the assistance of the governor and captain general of the West Indies, of the bishop of St. Jago de Cuba, and of most of the men of fashion and fortune belonging to the island. It was taken by the English in 1762, but restored to the Spaniards by the treaty of peace in 1763. It is seated on the W. side of the harbour. Lat 23. 12 N. Lon. 82. 13 W.

HAVANT, a town in Hampshire, with a market on Saturdays. Lat. 50. 52 N. Lon. 0. 58 E.

HAU'BERK. *s.* (*hauberg*, old French.) A coat of mail; a breastplate (*Spenser*).

To HAVE. *v. a.* 1 *have*, thou *hast*, he *hath*; we, ye, they *have*; pret. and part. pass. *had.* (habban, Saxon; *hebben*, Dutch.) 1. Not to be without (*Acts*). 2. To carry; to wear (*Sidney*). 3. To make use of (*Judges*). 4. To possess (*Exodus*). 5. To obtain; to enjoy (*John*). 6. To take; to receive (*Dryden*). 7. To be in any state (*Samuel*). 8. To put; to take (*Tusser*). 9 To procure; to find (*Locke*). 10. Not to neglect; not to omit (*Shakspeare*). 11. To hold; to regard (*Psalms*). 12. To maintain; to hold opinion (*Bacon*). 13. To contain (*Shakspeare*). 14. To require; to claim (*Dryden*). 15. To be a husband or wife to another (*Shakspeare*). 16 To be engaged, as in a task (*Addison*). 17. To wish; to desire (*Psalms*). 18. To buy (*Collier*). 19. It is most used in English, as in other European languages, as an auxiliary verb to make the tenses; *have*, *hast*, and *hath*, or *has*, the preterperfect; and *had* and *hast*, the preterpluperfect. 20. *Have at*, or *with*, is an expression denoting resolution to make some attempt (*Dryden*).

HAVEL, a river of Brandenburg, which proceeds from a lake in the duchy of Mecklenburg, and falls into the Elbe.

HAVELBERG, a town of Germany, in the electorate of Brandenburg, with a secularised bishop's see. Lat. 53. 5 N. Lon. 12. 26 E.

HA'VEN. *s.* (*haven*, Dutch.) 1. A port; a harbour; a station for ships (*Den.*). 2. A shelter; an asylum (*Shakspeare*).

HA'VENER. *s.* (from *haven.*) An overseer of a port (*Carew*).

HA'VER. *s.* (from *have.*) Possessor; holder (*Shakspeare*).

HAVER is a common word in the northern counties for oats (*Peacham*).

HAVERFORD-WEST, a town of Pembrokeshire, with markets on Tuesdays and Saturdays. It is a town and county of itself, seated on a creek of Milford-haven, over which is a stone bridge. The town is handsome: it contains three parishes, 613 houses, and 2880 inhabitants. It has a considerable trade, with several vessels belonging to it, and sends one member to parliament. The assizes and county gaol are kept here. Lat 51. 50 N. Lon. 5. 0 W.

HAVERILL, a town of Suffolk, with a market on Wednesdays, and a manufacture of checks, cottons, and fustians. Lat. 52. 6 N. Lon. 0. 28 E.

HAUGHT. *a.* (*haut*, French.) 1. Haughty; insolent: obsolete (*Shakspeare*). 2. High; proudly magnanimous (*Spenser*).

HA'UGHTILY. *ad.* (from *haughty.*) Proudly; arrogantly; contemptuously (*Dry.*).

HA'UGHTINESS. *s.* (from *haughty.*) Pride; arrogance (*Dryden*).

Haughtiness, says Dr. Cogan, is an overt act of pride, manifested by some conduct or expression, indicative of unmerited contempt of others. It may be deemed in this case the swelling of pride into an emotion.

HA'UGHTY. *a.* (*hautaine*, French.) 1. Proud; lofty; insolent; arrogant; cotemptuous (*Clarendon*). 2. Proudly great (*Prior*). 3. Bold; adventurous: obsolete (*Spenser*).

HA'VING. *s.* (from *have.*) 1. Possession; estate; fortune (*Shakspeare*). 2. The act or state of possessing (*Sidney*). 3. Behaviour; (*Shakspeare*).

HA'VIOUR. *s.* (for *behaviour.*) Conduct, manners: not used (*Spenser*).

To HAUL. *v. a.* (*haler*, French, to draw.) To pull; to draw; to drag by violence (*Pope*).

HAUL THE WIND, in naval affairs, to direct the ship's course nearer to that point of the compass from which the wind arises. *Example.* If a ship sail south-west, with the wind northerly, and it is necessary to haul the wind farther to the westward: to perform this operation, it is necessary to arrange the sails more obliquely with her keel; to brace the yards more forward, and to haul the lower sheets farther aft, and finally to put the helm over the larboard-side of the vessel. When her head is turned directly to the westward, and her sails are trimmed accordingly, she is said to have hauled the wind four points, that is to say, from south-west to west.

HAUL. *s.* (from the verb.) Pull; violence in dragging (*Thomson*).

HAUM. *s.* (healm, Saxon.) Straw (*Tusser*).

HAUNCH OF A HORSE, the hip of the animal. That part of the hind quarter which extends from the point of the hip-bone, down the thigh to the hock. The phrase "putting a horse upon his haunches," implies making him fix the principal weight of his frame upon his hind quarters, by which he bears less upon the bit, and becomes habitually light in hand.

HAUNCH OF VENISON, the hind quarter of a fallow deer (buck or doe) cut in a particular form for the table. The hind quarter of a stag, or hind, passes also under the same denomination; but it is more correct to call the former a haunch of venison; the latter, a haunch of red deer.

To HAUNT. *v. a.* (*hanter*, French.) 1. To frequent; to be much about any place or person (*Sidney*). 2. It is used frequently in an ill sense of one that comes unwelcome (*Swift*). 3. It is eminently used of apparitions that appear in a particular place (*Pope*).

To HAUNT. *v. n.* To be much about; to appear frequently (*Shakspeare*).

HAUNT. *s.* (from the verb.) 1. Place in which one is frequently found. 2. Habit of being in a certain place (*Arbuthnot*).

HA'UNTER. *s.* (from *haunt.*) Frequenter; one that is often found in any place (*Wotton*).

HA'VOCK. *s.* (*hafog*, Welsh.) Waste; wide and general devastation (*Addison*).

HA'VOCK. *interj.* A word of encouragement to slaughter (*Shakspeare*).

To HA'VOCK. *v. a.* (from the noun.) To waste; to destroy; to lay waste (*Milton*).

HAVRE, in geography, the same with haven or harbour.

HAVRE-DE-GRACE, a considerable seaport of France, in the department of Lower Seine, with a strong citadel and good arsenal. Lat. 49. 29 N. Lon. 0. 11 E.

HAUT, in music, high or shrill.

HAUTBOY. A portable wind instrument of the reed kind, adapted to high or shrill notes, consisting of a tube gradually widening from the top towards the lower end, and furnished with keys and circular holes for modulating its sounds. The name is French, *haut bois*, viz. high-wood, the instrument with which it is compared in the formation of the name being the bassoon, or low wood instrument.

HAUTEFEUILLE (John), an ingenious mechanic, born at Orleans in 1674. He made a great progress in mechanics in general, but had a particular taste for clock-work, and made several discoveries in it that were of singular use. It was he it seems who found out the secret of moderating the vibration of the balance by means of a small steel-spring, which has since been made use of. This discovery he laid before the members of the Academy of Sciences in 1694; and these watches are, by way of eminence, called pendulum-watches; not that they have real pendulums, but because they nearly approach to the justness of pendulums. M. Huygens perfected this happy invention; but having declared himself the inventor and obtained a patent for making watches with spiral springs, the abbé Feuille opposed the registering of it, and published a piece on the subject against Huygens. He died in 1724, at 50 years of age. Besides the above, he wrote a great many other pieces, most of which are small pamphlets, but very curious: as, 1. His perpetual Pendulum. 2. New Inventions. 3. The Art of Breathing under Water, and the means of preserving a Flame shut up in a small Place. 4. Reflections on Machines for raising Water. 5. His Opinion on the different Sentiments of Mallebranche and Regis, relating to the Appearance of the Moon when seen in the Horizon. 6. The magnetic Balance. 7. A Placet to the king on the Longitude. 8. Letter on the Secret of the Longitude. 9. A new System on the Flux and Reflux of the Sea. 10. The means of Making Sensible Experiments that prove the Motion of the Earth: and many other pieces.

HAW, a sort of berry, the fruit of several species of mespilus, thence denominated hawthorns. See MESPILUS.

It is among the apophthegms of lord Bacon, that "Store of haws portend a hard winter."

HAW, in the manage, the membrana nictitans of a horse's eye, common to him with

several other quadrupeds; but which from its enlargement when in an inflamed state, has induced some farriers to regard it as a morbid production, and to attempt its removal. Gibson himself has given directions for performing so absurd an operation.

Haw sometimes denotes a small parcel of land.

To Haw. *v. n.* To speak slowly with frequent intermission and hesitation (*L'Estran.*).

Haw-finch, in ornithology. See Loxia.

Haw-moth, in entomology. See Sphinx.

HAWK. *s.* In ornithology. See Falco.

Hawk. *s.* (*hoch*, Welsh.) An effort to force phlegm up the throat.

To Hawk. *v. n.* (from the noun.) 1. To fly hawks at fowls; to catch birds by means of a hawk (*Prior*). 2. To fly at; to attack on the wing (*Dryden*). 3. To force up phlegm with a noise (*Shakspeare*). 4. To sell by proclaiming in the streets (from *hock*, German, a salesman) (*Swift*).

Hawk-weed, in botany. See Hieracium.

Hawk-weed (Bastard). See Crepis.

HA'WKED. *a.* (from *hawk.*) Formed like a hawk's bill (*Brown*).

HAWKERS and Pedlars, are such dealers or itinerary petty chapmen as travel to different fairs or towns with goods or wares, and are placed under the controul of commissioners, by whom they are licensed for that purpose pursuant to stat. 8 and 9 W. III. c. 25. and 29 Geo. III. c. 26. Traders in linen and woollen manufactories sending their goods to markets and fairs, and selling them by wholesale; manufacturers selling their own manufactures, and makers and sellers of English bone-lace going from house to house, &c. are excepted out of the acts, and not to be taken as hawkers.

HAWKESWORTH (John), an ingenious writer, was born at Bromley in Kent, in 1715, and bred to the business of a watchmaker. He afterwards applied to literature, with considerable success. The Adventurer is his principal work, for which archbishop Herring conferred on him the degree of LL.D. He was employed to compile an account of the discoveries made in the south seas, for which he received the enormous sum of 6000l. He then became an East-India director, and died in 1773.

HAWKING, the art or exercise of chasing and taking wild fowl, by means of hawks, or birds of prey. Hawking is the same thing with what we otherwise call falconry. The word hawking, in its latitude, also includes the taming and disciplining of hawks, and fitting them for the sport.

In early times, hawking was the principal amusement of the English: a person of rank scarce stirred out without his hawk on his hand; which, in old paintings, is the criterion of nobility. Harold, afterwards king of England, when he went on a most important embassy into Normandy, is painted embarking with a bird on his fist, and a dog under his arm; and in an ancient picture of the nuptials of Henry VI. a nobleman is represented in much the same manner; for in those days, "it was thought sufficient for noblemen to winde their horn, and to carry their hawk fair, and leave study and learning to the children of mean people." The former were the accomplishments of the times; Spenser makes his gallant sir Tristram boast,

> Ne is there hawk which mantleth her on pearch,
> Whether high towring, or accoasting low,
> But I the measure of her flight doe search,
> And all her prey, and all her diet know.
> B. vi. Canto 2.

In short, this diversion was, among the old English, the pride of the rich, and the privilege of the poor; no rank of men seems to have been excluded the amusement: we learn from the book of St. Alban's, that every degree had its peculiar hawk, from the emperor down to the holy-water clerk. See Falconry.

HAWKINS (Sir John), an English writer and magistrate, was born in London in 1719. After receiving a good education he was articled to an attorney, in which situation he not only acquired a good knowledge of the law, but paid a particular attention to polite literature, and formed an early intimacy with Dr. Johnson, which lasted through life. He was also greatly attached to music, and belonged to a society of which Dr. Pepusch was the founder. Hawkins wrote several pieces in the periodical publications, particularly the Gentleman's Magazine; and in 1760 printed a good edition of Walton's complete Angler, with a Life of the Author and notes. In 1761 he was put into the commission of the peace for Middlesex, and distinguished himself as an active and disinterested magistrate. In 1772 he received the honour of knighthood, on account of his spirit in suppressing a dangerous riot in Moorfields. In 1776 he published his General History of Music, in five vols. 4to. a work which contains much curious information, but which has been superseded by Dr. Burney. After the death of Dr. Johnson he was employed by the booksellers to write his Life, which he executed, but not much to the satisfaction of the public. He died in 1789, and was interred in the cloisters of Westminster-abbey.

HAWSER, in the sea-language, a large rope or a kind of small cable, serving for various uses aboard a ship, as to fasten the main and fore shrouds, to warp a ship as she lies at anchor, and wind her up by a capstern, &c. The hawser of a man of war may serve for a cable to the sheet-anchor of a small ship.

HAWSES, in a ship, are two large holes under the bow, through which the cables run when she lies at anchor. Thus the hawse-pieces are the large pieces of timber in which these holes are made. Hawse-bags, are bags of canvas made tapering, and stuffed full of oakum; which are generally allowed small ships, to prevent the sea from washing in at

these holes: and hawse-plugs are plugs to stop the hawses, to prevent the water from washing into the manger.

There are also some terms in the sea-language that have an immediate relation to the hawses. Thus a bold hawse, is when the holes are high above the water. Fresh the hawse, or veer out more cable, is used when part of the cable that lies in the hawse is fretted or chafed, and it is ordered that more cable may be veered out, so that another part of it may rest in the hawses. Fresh the hawse, that is, lay new pieces upon the cable in the hawses, to preserve it from fretting. Burning in the hawse, is when the cables endure a violent stress. Clearing the hawses, is disentangling two cables that come through different hawses. To ride hawse-full, is when in stress of weather the ship falls with her head deep in the sea, so that the water runs in at the hawses.

HAWSHEAD, a town in Lancashire, with a market on Mondays. Lat. 54. 24 N. Lon. 3. 6 W.

HAWTHORN. See CRATÆGUS.

HAWTHORN (Black American). See VIBURNUM.

HAY. Grasses of any kind, mown, tedded, and dried as fodder for cattle. See HUSBANDRY.

To dance the HAY. To dance in a ring (*Shakspeare*).

HAY. *s.* (from *haie*, French.) A net which encloses the haunt of an animal (*Mortimer*).

HAY, a town in Brecknockshire, with a market on Saturdays. It has a castle nearly in the centre of the town; and about two miles distant are the ruins of the once famous Clifford castle, where fair Rosamond was born. Lat. 51. 59 N. Lon. 3. 4 W.

HAYE, a town of France, in the department of Indre and Loire. It is the birth-place of Des Cartes, and seated on the Reuse. Lat. 46. 56 N. Lon. 0. 46 E.

HAYES (Charles, Esq.), a very singular person, whose great erudition was so concealed by his modesty, that his name is known to very few, though his publications are many. He was born in 1678, and died in 1760, at 82 years of age. He became distinguished in 1704 by a Treatise of Fluxions, in folio, being, we believe, the first treatise on that science ever published in the English language; and the only work to which he ever set his name. In 1710 came out a small 4to pamphlet, in 19 pages, intitled, A new and easy Method to find out the Longitude from observing the Altitudes of the Celestial Bodies. Also, in 1723, he published, The Moon, a philosophical Dialogue; tending to shew, that the moon is not an opaque body, but has native light of her own.

To a skill in the Greek and Latin, as well as the modern languages, he added the knowledge of the Hebrew: and he published several pieces relating to the translation and chronology of the scriptures. During a long course of years he had the chief management of the late African company, being annually elected sub-governor. But on the dissolution of that company in 1752, he retired to Down in Kent, where he gave himself up to study; from whence, however, he returned in 1758, to chambers in Gray's inn, London, where he died in 1760, as mentioned above. He left a posthumous work, that was published in 8vo, under the title of Chronographia Asiatica et Egyptiaca, &c.

HAYLSHAM, a town in Sussex, with a market on Saturday. Lat. 50. 55 N. Lon. 0. 20 E.

HA'YMAKER. *s.* (*hay* and *make*.) One employed in drying grass for hay (*Pope*).

HAYNEA. In botany, a genus of the class syngenesia, order polygamia æqualis. Receptacle chaffy, fleshy; down simple; calyx ovate, imbricate. One species; an herbaceous plant of Guinea, with blue sessile flowers.

HAYWARD, a manorial officer, appointed to preserve the privileges, and protect the rights, immunities, and cattle, of those who are entitled to commonage of certain lands, wastes, &c. He also derives from his appointment, authority to drive his district at stated periods; to impound strays, and prevent nuisances of diseased cattle; as well as to adjudge in the case of tresspasses, in the case of cattle breaking bounds or destroying fences. To all which concerns there are certain local fees attached, according to the custom of the country. It is a beneficial office when properly conducted.

HAZARD. *s.* (*hazard*, French.) 1. Chance; accident; fortuitous hap (*Locke*). 2. Danger; chance of danger (*Rogers*). 3. A game at dice (*Swift*).

To HAZARD. *v. a.* (*hazarder*, French.) To expose to chance (*Hayward*).

To HAZARD. *v. n.* 1. To try the chance (*Shakspeare*). 2. To adventure (*Waller*).

HAZARD, a fashionable and fascinating game of chance, played with a box and pair of dices, and of considerable antiquity, as we know from the following distich in Shakspeare's Richard III.

"Slave, I have set my life upon a cast,
"And I will stand the hazard of the die."

In its decision it is the most rapid of all chancing, and fair enough in itself when played honourably. The person holding the box is called the caster, who having been set as much money by the surrounding company, or by any single individual, as he proposes to throw for, and the stake or stakes being deposited within a centrical circle upon the table, throws the dice from the box, when whatever number appears upon the surface is termed "the main;" and is so vociferated publicly by a person called the groom porter, who stands above the rest, and whose business it is to call the main and chance, to furnish fresh dice when demanded, and to receive the money for a box-hand when due. As soon as the main is declared, which, in fact, is the number by which the caster's opponents must abide for themselves, the caster throws a second

time, and this number is called the chance, being his own chance against the main previously thrown; and so named, because it is the number of the main of the players against the chance of the individual who is the caster, and makes stakes against the whole, or any part of the rest.

The main and chance being proclaimed by the groom porter, odds are generally laid between the throws upon the termination of the game according to the numbers opposed to each other, and to the scale by which all bets upon the game are regulated, and strictly observed. The caster may, or may not, engage in any of these bets, though he very frequently does, as a hedge (or fence) to his own stakes, when the odds are six to four, or two to one, in his favour: at any rate, he continues to throw the dice in succession, till either the main or chance appear: if the main be first thrown, those who "set the caster" draw their money; and the caster is then said to have "thrown out," and passes the box to his next neighbour: on the contrary, should he throw his own chance first, he is the winner, and of course not only draws all the money he staked and betted, but continues to hold the box, and throw a "new main" for any sum he wishes to be set, in which a caster is never known to be disappointed.

When a caster has thrown in (that is, has won) three times in succession, it is termed "a box hand," and he then pays half a guinea to the groom porter, for the privilege of playing, the use of the box and dice, negus, &c. provided for the accommodation of the company. The box continues in the caster's possession as long as he continues to throw in (paying an additional half guinea every third time of winning); but on the first time of losing he resigns the box to the player sitting next to him, who proceeds in the same manner as himself, unless he requests, and is permitted to renew his own play, which is then called taking "a back hand."

HA'ZARDABLE. *a.* (from *hazard.*) Venturous; liable to chance (*Brown*).

HA'ZARDER. *s.* (from *hazard.*) He who hazards.

HA'ZARDRY. *s.* (from *hazard.*) Temerity; precipitation; obsolete (*Spenser*).

HA'ZARDOUS. *a.* (*hazardeux*, French.) Dangerous; exposed to chance (*Dryden*).

HA'ZARDOUSLY. *ad.* (from *hazardous.*) With danger or chance.

HAZE. *s.* Fog; mist.

To HAZE. *v. n.* To be foggy or misty.

To HAZE. *v. a.* To fright one (*Ainsworth*).

HA'ZEL. *s.* (hæsel, Saxon.) See CORYLUS.

HAZEL WITCH. See HAMAMELIS.

HA'ZEL. *a.* (from the noun.) Light brown; of the colour of hazel (*Mortimer*).

HA'ZELLY. *a.* Of the colour of hazel; of a light brown (*Mortimer*).

HA'ZY. *a.* (from *haze.*) Dark; foggy; misty (*Burnet*).

HE. *pronoun.* gen. *him*; plur. *they*; gen. *them*; (he, Saxon.) 1. The man that was named before (*Milton*). 2. The man; the person (*Daniel*). 3. Man, or male being (*Dryden*). 4. Male; as, a *he* bear, a *he* goat (*Bacon*).

HEAD. *s.* (heafod, heafd, Saxon.) 1. That part of the animal that contains the brain, or the organ of sensation and seat of thought (*Dryden*). 2. Person as exposed to any danger or penalty: *the penalty was on his* head (*Milton*). 3. HEAD *and ears.* The whole person (*Granville*). 4. Denomination of any animals: *the* head *of oxen* (*Arbuthnot*). 5. Chief; principal person; one to whom the rest are subordinate (*Tillotson*). 6. Place of honour; the first place (*Addison*). 7. Place of command (*Addison*). 8. Countenance; presence (*Dryden*). 9. Understanding; faculties of the mind (*L'Estrange*). 10. Face; front; forepart (*Dryden*). 11. Resistance; hostile opposition (*South*). 12. Spontaneous resolution (*Davies*). 13. State of a deer's horns, by which his age is known (*Shaks.*). 14. Individual (*Graunt*). 15. The top of any thing bigger than the rest (*Watts*). 16. The forepart of any thing, as of a ship (*Raleigh*). 17. That which rises on the top (*Mortimer*). 18. The blade of an axe (*Deuteronomy*). 19. Upper part of a bed (*Genesis*). 20. The brain (*Pope*). 21. Dress of the head (*Swift*). 22. Principal topic of discourse (*Atterbury*). 23. Source of a stream (*Raleigh*). 24. Crisis; pitch (*Addison*). 25. Power; influence; force; strength; dominion: *they gather* head (*Milt.*). 26. Body; conflux (*Bacon*). 27. Power; armed force (*Shakspeare*). 28. Liberty in running a horse (*Shakspeare*). 29. Licence; freedom from restraint (*South*). 30. It is very improperly applied to roots: as *a* head *of garlick* (*Gay*). 31. HEAD *and shoulders.* By force; violently (*Felton*).

HEAD. (*Caput.*) In anatomy, the superior part of the body placed upon the neck, containing the cerebrum, cerebellum, and medulla oblongata. It is divided into the face and hairy part. On the latter is observed the *vertex*, or crown of the head; the *sinciput*, or fore part; the *occiput*, or hinder part. For the former, see FACE. For the bones and muscles of the head, see CRANIUM. The common integuments of the head are called the scalp.

HEAD, in architecture. Heads are used as an ornament of sculpture or carved work, frequently serving as the key of an arch or platband, and on other occasions.

In heraldry, the heads of men, beasts, birds, &c. are borne in armoury, either full-faced and in front, or side-faced and in profile, which must be distinguished in blazoning.

Among medallists, the different heads on ancient coins are distinguished by the different dresses thereof. See MEDAL.

HEAD. Capitulum. In botany, a species of inflorescence, or a manner of flowering, in which several flowers form a kind of ball. As in gomphrena. This is globular, roundish, or halved. Leafy, or naked.

Flowers in this case are said to grow in a head. Capitati flores. A stigma round like a ball, is called capitatum stigma; headed or head-shaped.

HEAD OF A DEER. See ANTLERS.

HEAD. *a.* Chief; principal (*Clarendon*).

To HEAD. *v. a.* (from the noun.) 1. To lead; to influence; to direct; to govern (*Pri.*). 2. To behead; to kill by taking away the head (*Shakspeare*). 3. To fit any thing with a head, or principal part (*Spenser*). 4. To lop trees (*Mortimer*).

HE'ADACH. *s.* Pain in the head (*Sidney*).

HE'ADBAND. *s.* (*head* and *band.*) 1. A fillet for the head; a topknot (*Isaiah*). 2. The band at each end of a book.

HEADBORROW; or HEADBOROUGH, the chief of the frankpledge, and he that had the principal government of them within his own pledge. And as he was called headborrow, so was he called burrowhead, bursholder, thirdborrow, tithingman, chief pledge, or borrow-elder, according to the diversity of terms in several places. The same officer is now occasionally called a constable. The headborough was the chief of the ten pledges; the other nine were called hardboroughs, or inferior pledges.

HE'ADDRESS. *s.* (*head* and *dress.*) 1. The covering of a woman's head (*Pope*). 2. Any thing resembling a headdress, and prominent on the head (*Addison*).

HE'ADER. *s.* (from *head*) 1. One that heads nails or pins, or the like. 2. The first brick in the angle (*Moxon*).

HEADFORD, a town of Ireland, in the county of Galway. Lat. 53. 29 N. Lon. 0. 3 W.

HE'ADINESS. *s.* (from *heady.*) Hurry; rashness; stubbornness; precipitation (*Sp.*).

HE'ADLAND. *s.* (*head* and *land.*) 1. Promontory; cape (*Dryden*). 2. Ground under hedges (*Tusser*).

HE'ADLESS. *a* (from *head.*) 1. Without a head; beheaded (*Spenser*). 2. Without a chief (*Raleigh*). 3. Obstinate; inconsiderate; ignorant; wanting intellects (*Spenser*).

HE'ADLONG. *a.* 1. Steep; precipitous. 2. Rash; thoughtless. 3. Sudden; precipitate (*Sidney*).

HE'ADLONG. *ad.* (*head* and *long.*) 1. With the head foremost (*Pope*). 2. Rashly; without thought; precipitately (*Dryden*). 3. Hastily; without delay or respite (*Dryden*).

HEAD-MOULT-SHOT, in veterinary science, is when the sutures of the scull of an animal and especially the coronal, are equitant, or ride over each other; which is sometimes the case in young animals, and often produces convulsions and death.

HE'ADPIECE. *s.* (*head* and *piece.*) 1. Armour for the head; helmet; morion (*Sw.*). 2. Understanding; force of mind (*Prideaux*).

HE'ADQUARTERS. *s.* (*head* and *quarters.*) The place of general rendezvous, or lodgment for soldiers. Properly two words (*Collier*).

HEAD-SEA, is when a great wave or billow of the sea comes right ahead of the ship, as she is in her course.

HEAD-SAILS, in a ship, those which belong to the fore-mast and boltsprit: for it is by these that the head of the ship is governed, and made to fall off and keep out of the wind; and these in quarter-winds are the chief drawing sails.

HE'ADSHIP. *s.* (from *head.*) Dignity; authority: chief place.

HE'ADSMAN. *s.* (*head* and *man.*) Executioner: one that cuts off heads (*Dryden*).

HEADSTALL, in antiquity. See CAPISTRUM.

HEAD-STALL of a horse, that part of the caveson, bridle or hunting-rein-halter which passes round and on each side of a horse's head, and to which the reins of either are affixed, for use in the field or on the road, and for safety in the stable.

HE'ADSTONE. *s.* (*head* and *stone.*) The first or capital stone (*Psalms*).

HE'ADSTRONG. *a.* (*head* and *strong.*) Unrestrained; violent; ungovernable (*Hooker*).

HE'ADWORKMAN. *s.* (*head* and *workman.*) The foreman. Properly two words (*Swift*).

HE'ADY. *a.* (from *head.*) 1. Rash; precipitate; hasty; violent (*Addison*). 2. Apt to affect the head (*Boyle*). 3. Violent; impetuous (*Shakspeare*).

To HEAL. *v. a.* (hælan, Saxon.) 1. To cure a person; to restore from hurt or sickness (*Watts*). 2. To cure a wound or distemper (*Wiseman*). 3. To perform the act of making a sore to cicatrize (*Wiseman*). 4. To reconcile: as, he *healed* all dissensions.

To HEAL. *v. n.* To grow well (*Sharp*).

HE'ALER. *s.* One who cures or heals (*Isaiah*).

HEALING, in architecture, is sometimes used to denote the covering the roof of a building.

HE'ALING. *participial a.* (from *heal.*) Mild; mollifying; gentle; assuasive.

HEALTH. *s.* (from heel, Saxon.) 1. Freedom from bodily pain or sickness. 2. Welfare of mind; purity; goodness (*Bacon*). 3. Salvation spiritual and temporal (*Psalms*). 4. Wish of happiness used in drinking (*Shakspeare.*)

HE'ALTHFUL. *a.* (*health* and *full.*) 1. Free from sickness (*South*). 2. Well disposed (*Shakspeare*). 3. Wholesome; salubrious (*Bacon*). 4. Salutary; productive of salvation (*Common Prayer*).

HE'ALTHFULLY. *ad.* (from *healthful.*) 1. In health. 2. Wholesomely.

HE'ALTHFULNESS. *s.* (from *healthful.*) 1. State of being well. 2. Wholesomeness; salubrious qualities (*Addison*).

HE'ALTHILY. *ad.* (from *healthy.*) Without sickness or pain.

HE'ALTHINESS. *s.* (from *healthy.*) The state of health.

HE'ALTHLESS. *a.* (from *health.*) 1. Weak; sickly; infirm. 2. Not conducive to health (*Taylor*).

HE'ALTHSOME. *a* (from *health.*) Wholesome; salutary: not used (*Shakspeare*).

HE'ALTHY. *a.* (from *health.*) 1. Enjoying health; free from sickness; hale; sound (*Arbuthnot*). 2. Conducive to health; wholesome (*Locke*).

HEAM. *s.* In beasts, the same as the afterbirth in women.

HEAP. *s.* (heap, Saxon.) 1. Many single things put together; a pile; an accumulation (*Dryden*). 2. A crowd; a throng; a rabble (*Bacon*). 3. Cluster; number driven together (*Dryden*).

To HEAP. *v. a.* (from the noun.) 1. To throw on heaps; to pile; to throw together (*Ezekiel*). 2. To accumulate; to lay up (*Job*). 3. To add to something else (*Shakspeare*).

HEAPED PANICLE. In botany, congesta panicula. Abundant in flowers, but not so close as in a dense panicle.

HEA'PER. *s.* One that makes piles or heaps.

HEA'PY. *a.* (from *heap.*) Lying in heaps

To HEAR. *v. n.* (hynan, Saxon.) 1. To enjoy the sense by which sounds are distinguished (*Holder*). 2. To listen; to hearken (*Denham*). 3. To be told; to have an account (*Acts*).

To HEAR. *v. a.* 1. To perceive by the ear (*Chronicles*). 2. To give an audience, or allowance to speak. 3. To attend; to listen to; to obey (*Eze.*). 4. To attend favourably (*Mat.*). 5. To try; to attend judicially (*Deuteron.*). 6. To acknowledge a title (*Prior*).

HEARD signifies a keeper; as *heard-bearht*, a glorious keeper. Now written *herd* (*Gibson*).

HE'ARER. *s.* (from *hear.*) 1. One who hears (*Hooker*). 2. One who attends to any doctrine or discourse orally delivered by another. 3. One of a collected audience (*Ben Jonson*).

HE'ARING. *s.* (from *hear.*) 1. The sense by which sounds are perceived. 2. Audience (*Shakspeare*). 3. Judicial trial (*Addison*). 4. Reach of the ear (*Hooker*).

HEARING, the art or faculty of perceiving sounds. This sense is placed by physiologists among the animal actions. It is a sensation by which we hear the sound of sonorous bodies. The organ of hearing is the soft portion of the auditory nerve which is distributed on the vestibule, semicircular canals, and cochlea. The curious structure of the labyrinth and cochlea tend to make the weakest sounds audible; for the whole organ of hearing being included in a small space, had the auditory nerve run in a straight line, the impression would only have been made on a very small part of it; and the strength of the impression being, *cæteris paribus*, always as the number of parts upon which the impression is made, sounds which are now low could not have been heard at all. If the auditory nerve had, like the retina, been expanded into a large web, which had covered or lined some wide cavity, the impression of sounds, even in this case, had been much weaker than they are now; for this large cavity had given room for the sounds to dilate, and all sounds grow weaker as they dilate.

Both these inconveniences are prevented by the present structure of the labyrinth and cochlea, whose canals, by their winding, contain large portions of the auditory nerve, upon every point of which the smallest sound being at once impressed becomes audible, and by their narrowness the sounds are hindered from dilating; and the impressions made upon the nerves by the first dilatations are always the strongest.

When a person exercises great attention in hearing, the membrana tympani is stretched or strained so as to render it more susceptible of sounds, and better prepared to catch even the most feeble agitations and vibrations of the air or other medium.

It must be observed, however, that though the ear be the ordinary organ of hearing, yet the ideas of sounds are often conveyed to the mind by other means, particularly by the teeth. Thus, if a tuning fork, or any other vibrating body, be properly applied to the teeth, the idea of sound will be excited distinctly, whether the ears be open or stopped. It is very probable, notwithstanding, that the ear, even in this case, is in some measure concerned in transmitting the impression to the sensory. The entrance to the ear in some animals is from the mouth. It is so in frogs. It is so partly in man by means of the Eustachian tube. Fishes were long suspected to be without an auditory organ, but this is now clearly ascertained. In some fishes the bones of the ear are on the outside of the cranium.

HEARING (Difficulty of). See DEAFNESS.

To HE'ARKEN. *v. n.* (heancnian, Saxon.) 1. To listen; to listen curiously (*Rogers*). 2. To attend; to pay regard (*Pope*)

HE'ARKENER. *s.* Listener; one that hearkens.

HE'ARSAY. *s.* (*hear* and *say.*) Report; rumour (*Raleigh*).

HEARSE. *s.* (See HERSE.) 1. A carriage in which the dead are conveyed to the grave. 2. A temporary monument set over a grave (*Shakspeare*).

HEART. *s.* (heopt, Saxon.) 1. The muscle which, by its contraction and dilatation, propels the blood through the course of circulation, and is therefore considered as the source of vital motion. 2. The chief part; the vital part (*Bacon*). 3. The inner part of any thing (*Abbot*). 4. Person; character (*Shaks.*). 5. Courage; spirit (*Clarendon*). 6. Seat of love (*Pope*). 7. Affection; inclination (*Dry.*). 8. Memory (*Pope*). 9. Good-will; ardour of zeal (*Clarendon*). 10. Passions; anxiety; concern (*Shakspeare*). 11. Secret thoughts; recesses of the mind (*Davies*). 12. Disposition of mind (*Sidney*). 13. A *hard heart* is cruelty (*Rowe*). 14. *To find in the* HEART. To be not wholly averse (*Sidney*). 15. Secret meaning; hidden intention (*Shakspeare*). 16. Conscience; sense of good or ill (*Hooker*). 17.

strength; power (*Bacon*). 18. Utmost degree (*Shakspeare*). 19. It is much used in composition for mind, or affection.

HEART. (*Cor.*) In anatomy, a hollow muscular viscus, situated in the cavity of the pericardium for the circulation of the blood. It is divided externally into a base, or its broad part; a superior, and an inferior surface, and an anterior and posterior margin. Internally it is divided into a right and left ventricle. The situation of the heart is oblique, not transverse; its base being placed on the right of the bodies of the vertebræ, and its apex obliquely to the sixth rib on the left side; so that the left ventricle is almost posterior, and the right anterior. Its inferior surface lies upon the diaphragm. There are two cavities adhering to the base of the heart, from their resemblance called auricles. The right auricle is a muscular sac, in which are four apertures, two of the venæ cavæ, an opening into the right ventricle, and the opening of the coronary vein. The left is a similar sac, in which there are five apertures, viz. those of the four pulmonary veins, and an opening into the left ventricle. The cavities in the base of the heart are called ventricles: these are divided by a fleshy septum, called septum cordis, into a right and left. Each ventricle has two orifices; the one auricular, through which the blood enters; the other arterious, through which the blood passes out. These four orifices are supplied with valves, which are named from their resemblance; those at the arterious orifices are called semilunar; those at the orifice of the right auricle, mitral; and those at the orifice of the left auricle, tricuspid. The valve of Eustachius is situated at the termination of the vena cava inferior, just within the auricle. The substance of the heart is muscular, its exterior fibres are longitudinal, its middle transverse, and its interior oblique. The internal superficies of the ventricles and auricles of the heart is invested with a strong and smooth membrane, which is extremely irritable. The vessels of the heart are divided into common and proper. The common are, 1. The aorta, which arises from the left ventricle. 2. The pulmonary artery, which originates from the right ventricle. 3. The four pulmonary veins, which terminate in the left auricle. 4. The venæ cavæ, which evacuate themselves into the right auricle. The proper vessels are, 1. The coronary arteries, which arise from the aorta, and are distributed on the heart. 2. The coronary veins, which return the blood into the right auricle. The nerves of the heart are branches of the eighth and great intercostal pairs. The heart of the fœtus differs from that of the adult in having a foramen ovale, through which the blood passes from the right auricle to the left, and a canalis arteriosus, through which it is conveyed from the pulmonary artery to the aorta; a third part of the whole blood passing through this opening into the system at large, without any communication whatever with the lungs, and about half the blood that is thrown from the right ventricle into the pulmonary artery; the remaining third passing from the right to the left auricle through the medium of the foramen ovale.

HEART OF A SEED. Corculum. In botany, the corcle or rudiment of the future plant. It consists of the plumule (*pluwula*) and rostel (*rostellum*.) See CORCULUM.

HEART-ACH. *s* Sorrow; pang; anguish of mind (*Shakspeare*).

HEART-BREAK. *s.* Overpowering sorrow (*Shakspeare*).

HEART-BREAKER. *s.* A cant name for a woman's curls (*Hudibras*).

HEART-BREAKING. *a.* Overpowering with sorrow (*Spenser*).

HEART-BREAKING. *s.* Overpowering grief (*Hakewill*).

HEART-BURNED. *a.* Having the heart inflamed (*Shakspeare*).

HEART-BURNING. *s.* 1. Pain at the stomach, commonly from an acrid humour (*Woodward*). 2. Discontent; secret enmity (*Swift*).

HEART-DEAR. *a.* Sincerely beloved (*Shakspeare*).

HEART-EASE. *s.* Quiet; tranquillity (*Shakspeare*).

HEART'S-EASE, in botany. See VIOLA.

HEART-EASING. *a.* Giving quiet (*Milton*).

HEART-FELT. *a.* Felt in the conscience

HEART-PEAS. *s.* A plant (*Miller*).

HEART-QUELLING. *a.* Conquering the affection (*Spenser*).

HEART-RENDING. *a.* Killing with anguish (*Waller*).

HEART-SHAPED LEAF. In botany, a leaf somewhat ovate, hollowed at the base, without posterior angles. It is often called cordate.

HEART-SICK. *a.* 1. Pained in mind (*Taylor*). 2. Mortally ill; hurt in the heart (*Shakspeare*).

HEART-SORE. *s.* That which pains the mind (*Spenser*).

HEART-STRING. *s.* The tendons or nerves supposed to brace and sustain the heart (*Spenser*).

HEART-STRUCK. *a.* 1. Driven to the heart; infixed for ever in the mind (*Shaks.*). 2. Shocked with fear or dismay (*Milton*).

HEART-SWELLING. *a.* Rankling in the mind (*Spenser*).

HEART-TONGUED FROND. In botany, tongue-shaped and hollowed at the base. As in asplenium scolopendrium.

HEART-WHOLE. *a.* 1. With the affections yet unfixed (*Dryden*). 2. With the vitals yet unimpaired.

HEART-WOUNDED. *a.* Filled with passion of love or grief (*Pope*).

HE'ARTED. *a.* It is only used in composition: as hard *hearted* (*Gay*).

To HE'ARTEN. *v. a.* (from *heart.*) 1. To encourage; to animate; to stir up (*Shak.*). 2. To meliorate with manure (*May*).

HEARTH. *s.* That part of the floor of a room on which a fire is made, or where the grate stands.

HEARTH-MONEY, or CHIMNEY-MONEY,

the name appropriated to a duty on houses, first levied in the reign of Charles II. This tax being much complained of, though only 2s. per annum, has been since taken off.

HE'ARTILY. *ad.* (from *hearty*.) 1. From the heart; fully (*Prior*). 2. Sincerely; actively; diligently (*Atterbury*). 3. Eagerly; with desire (*Addison*).

HE'ARTINESS. *s.* (from *hearty*). 1. Sincerity; freedom from hypocrisy (*Shaks.*). 2. Vigour; eagerness (*Taylor*).

HE'ARTLESS. *a.* (from *heart.*) Without courage; spiritless (*Cowley*).

HE'ARTLESSLY. *ad.* Without courage; faintly; timidly.

HE'ARTLESSNESS. *s.* (from *heartless.*) Want of courage or spirit; dejection of mind.

HE'ARTY. *a.* (from *heart*). 1. Sincere; undissembled; warm; zealous (*Sw.*). 2. In full health. 3. Vigorous; strong (*Pope*). 4. Strong; hard; durable (*Wotton*).

HEARTY-HALE. *a.* (*hearty* and *hale.*) Good for the heart (*Spenser*).

HEAT. *s.* (heat, hæt, Saxon.) 1. The sensation caused by the approach or touch of fire (*Locke*). 2. The cause of the sensation of burning (*Hooker*). 3. Hot weather (*Addison*). 4. State of any body under the action of the fire (*Moxon*). 5. Fermentation; effervescence. 6. One violent action unintermitted (*Dryden*). 7. The state of being once hot (*Dryden*). 8. A course at a race (*Dryden*). 9. Pimples in the face; flush (*Addison*). 10. Agitation of sudden or violent passion; vehemence of action (*Sidney*). 11. Faction; contest; party rage (*K. Charles*). 12. Ardour of thought or elocution (*Addison*).

To HEAT. *v. a.* (from the noun). 1. To make hot; to endue with the power of burning (*Daniel*). 2. To cause to ferment (*Mortimer*). 3. To make the constitution feverish (*Arb.*). 4. To warm with vehemence of passion or desire (*Dryden*). 5. To agitate the blood and spirits with action (*Dryden*).

HEAT, in natural philosophy and chemistry, one of the effects of fire or caloric, indicated by an increase of temperature, and the sensation it produces upon the organs of feeling.

Although in our article CALORIC we urged the propriety of using such language, invariably, as would distinguish the cause of heat from the sensation, we yet promised, as the term heat is frequently employed, especially in the earlier chemical writings, to express both, to exhibit in this article a sketch of the opinions that have been at different times held on this mysterious subject.

The two great divisions under which these opinions may properly be arranged are, on the one side, that heat is not material, but that it is merely a quality, modification, circumstance or affection of matter, consisting in internal vibrations or collisions of its particles, or in some other mode of corpuscular action; and, on the other side, that heat, and the effects which accompany it, are produced by the operation of a peculiar material fluid.

In the list of those who maintain the former sentiment may be classed, particularly, Aristotle, and the Peripatetics, among the ancients; and Des Cartes, lord Bacon, Boyle, Newton, Macquer, count Rumford, and among the moderns professor Davy.

Aristotle, and his followers the Peripatetics, as far as the opinions of this philosopher can be traced amidst the obscurities which surround them, appears to have considered heat as a quality, or, according to his phraseolgy, one of the primary qualities of sensible bodies. Upon the union of these primary qualities with each other, he founded the origin of the four elements, as they were called: heat and dryness, he supposed, droduced fire; heat and moisture, air; cold and moisture, water; cold and dryness, earth.

The Cartesians assert that heat consists in a certain motion of the insensible particles of a body, resembling the motion by which the several parts are agitated by the motion of the heart and blood. Whether this comparison was intented to illustrate the doctrine or not it is rather difficult to determine; but independently of this consideration, the opinion itself seems to bear some analogy to that of lord Bacon, of which we now proceed to treat.

This extraordinary man, who left no object of physical or intellectual enquiry untouched, wrote a treatise expressly on the nature of heat, De Forma Calidi, in which he delivers his opinion, deduced from a great number of experiments and considerations, that heat in bodies is no other than motion only, a motion so and so circumstanced; so that to produce heat in a body, nothing is required but to excite such motion in the parts of the body. Not, as he intimates, that motion generates heat, or heat motion—though, in many cases, this is true—but that the very thing heat is very motion and nothing else. All motion, however, he argues, is not heat; since it requires several peculiar circumstances to render it so: in the first place, it must be expansive; secondly, it must be directed towards the circumference, and at the same time upwards; thirdly, the expansive motion is not equable throughout the whole body, but only affects its smaller particles; and fourthly, this motion must be very rapid. From all these requisites in the formation of heat lord Bacon infers as a general defininition, that heat is "an expansive undulatory motion in the minute particles of a body, by which they tend with some rapidity towards the circumference, and at the same time incline a little upwards."

Mr. Boyle, whose experiments were still more numerous and diversified than those of lord Bacon, argues, from what he calls the producibility of heat, against its materiality.

To the various methods of producing heat, such as friction, collision, percussion, &c. we have already adverted in the article CALORIC. Now that which may be produced by mechanical means, he observes, cannot be matter; for it is out of the power of any human being to create new matter, how much soever he may disguise, increase, or alter the property of any body or set of bodies by mixture, combination, or any other means. This mode of reasoning he pursued in a number of valuable treatises which he wrote upon the subject, and exemplified in a variety of respects with great ingenuity and address. He appears to coincide very nearly with Bacon in his opinion of the nature of heat, which, he thinks, seems principally to consist in that mechanical property of matter called motion, but which in this case is subject to three conditions, or modifications. 1st. The agitation of the parts of the body must be vehement, for this distinguishes the bodies said to be hot from

those which are barely fluid; 2d, that the determination be various, and tend all manner of ways; 3d, that the agitated particles, or at least the greatest number of them, be so minute as to be singly insensible.

Sir Isaac Newton, as well as most of the mechanical philosophers of that age, may be ranked on the same side of the question, though he maintains an opinion somewhat different from any of the preceding.

"Fire," says he, "is only a body much ignited, i. e. heated hot, so as to emit light copiously; what else," he asks, "is a red hot iron than fire? and what else is a burning coal than red hot wood? or flame itself, than red hot smoke? 'Tis certain that flame is only the volatile part of the fuel heated red hot, that is, so hot as to shine; and hence only such bodies as are volatile, that is, such as emit a copious fume, will flame, nor will they flame longer than they have fume to burn," &c. &c. See his Optics.

In like manner, he conceives that "gross bodies may be converted into light, by the agitation of their particles; and light, again, into gross bodies by being fixed therein" In these cases he appears to consider light as inseparable from fire or flame.

Macquer, although in the article Fire in his excellent Chemical Dictionary, he regards it as "a body essentially fluid"—"the only body essentially fluid," and "consequently the cause of the fluidity of other bodies;" and although he speaks of the great facility with which it penetrates other bodies, or separates from them, and infers from these and other facts, the "infinite smallness of the integrant parts of fire," meaning by this term the cause of heat, or what is now denominated caloric; yet in the appendix to his Dictionary, when treating of the same subject, he expresses an opinion directly the reverse of this, and calls heat "only a mode of existence of a material substance." He carries on the discussion through several pages with much ability; and, among various other modes of argumentation, he institutes an analogy, which he sustains with considerable ingenuity, between the communication of heat and the communication of motion, deducing from the known and acknowledged laws of the latter the similarity of the former, and maintaining consequently that heat is "really nothing else than the motions of the parts of heated bodies." Our limits will not allow us to give an abstract of his reasoning, which we should otherwise be glad to do; we quote, however, his conclusion.

"I have hitherto," says he, "been of opinion, I confess, with most natural philosophers, that heat was a particular kind of matter, so subtile as to penetrate all bodies, and to separate their parts, when put in action by light, or by percussion; and that this being was the true matter of fire: but the above reflections have suggested a very different opinion. There certainly is a matter of fire; and it is pure light, which is a material substance, whose existence cannot be questioned. But we cannot say the same of heat; the causes which excite it, and the effects which it produces, do not prove, or even suppose, the existence of a peculiar matter. They all concur, on the contrary, to indicate that it is only an accident, a modification of which some bodies are susceptible, and consisting merely in the intestine motion of their aggregant and constituent parts, and which may be produced, not only by the impulse of light, but also by all frictions and percussions of any bodies."

Count Rumford, from two considerations, infers the immateriality of heat: 1st, from his frequent failures in attempting to discover that it had any weight; and 2dly, from the possibility, which he conceives he has demonstrated, of obtaining an inexhaustible supply of heat from a given quantity of insulated matter.

It is well known that on the freezing of water, a portion of heat is given out, sufficient to raise the temperature of an equal quantity of water no less than 140°, that is from 32 to 172°. If, therefore, heat were a ponderable substance, it is reasonable to imagine that water would become lighter when frozen in a vessel hermetically seated. The count, accordingly, made a number of experiments with a view to determine this point; but could not discern the least difference between the weight of the water before freezing, and that of the ice when frozen. From this he makes his first deduction of the imponderability of heat, and draws the more extensive, but less cautious inference, that all future attempts "to discover any effect of heat upon the apparent weights of bodies will be fruitless." Phil. Trans. 1799. Part II. or Nich. Jo. 4to. vol. III.

The other deduction, mentioned above, was made from the following experiments. The count procured a cylinder of brass, bored like a cannon. By means of the engine used for boring cannon in the arsenal of Munich, a blunt borer, or flat piece of hardened steel, was kept with one of its extremities strongly pressed against the bottom of this hollow cylinder, while the latter was turned swiftly about its axis. In one experiment, the cylinder was covered on the outside with a coating of thick flannel; in another, the borer was made to work through a collar of leathers; in a third, the cylinder was wholly immersed in water, the borer still working through the leathern collar; in a fourth, the leather was removed, and the water had access to the interior of the cylinder, where the friction took place. In all these cases, a very considerable quantity of heat was produced, much more than he conceived it possible for the machinery to supply: and in one experiment heat was generated by the friction in sufficient quantity to cause about 26½ pounds of ice-cold water to boil in two hours and a half. The capacity of the brass for heat, or its power of producing it by friction, did not appear to be diminished, and it seemed as if this evolution of heat would have gone on for ever if the friction had been continued. Now, as any thing which any insulated body, or system of bodies, can continue to furnish without limitation, cannot possibly be a material substance, the inference of our author is that heat is not of this description: at the same time he acknowledges the difficulty of forming any distinct idea on the subject of heat, capable of being excited and communicated in the manner shewn by these experiments, "except it be motion." Essays, vol. II, Leybourn's Tracts, vol. I.

In the prosecution of this important enquiry count Rumford has since made a great number of ingenious experiments, from which, if he has failed to determine what heat really is, and has even on some occasions, we think, furnished data for conclusions opposite to those we have stated; he has, notwithstanding, enlarged in a very considerable degree our knowledge of its laws of action, propagation, and economy; and has furnished a

great number of very valuable hints and directions for the better management and supply of this wonderful agent, in domestic concerns, commercial undertakings, and chemical researches.

With respect to the relation between heat and light, the count appears to entertain an opinion nearly similar to that of Macquer, already quoted. In a series of experimental investigations concerning heat, an account of which he communicated, from Munich, to the National Institute of France, and to the 12th volume of Nicholson's Journal, he had in view the determination of this among other particulars: after ascertaining that, when a hot body is cooled in tranquil air, a very small part of the heat, about $\frac{1}{5}$th, is communicated to the air, all the rest being communicated by radiation through the air to the surrounding solid bodies, and confirming, by various results, his hypothesis of the immateriality of heat, he proceeds to treat of the communication of heat among solid bodies, and concludes with an enquiry whether the quantity of heat excited by the striking of the solar rays upon an opake body is always in proportion to the quantity of light that has disappeared. This question he answers in the affirmative; ascribing to light the power of producing heat. This last position, however, has been rendered doubtful, or rather proved erroneous, by Dr. Herschell's distinction in the solar rays between those which produce heat, and those which only illuminate.

A further account of Dr. Herschell's experiments on the solar rays, together with those of Wollaston, Bockman, and others, will be found in the article SUN.

The principal writers on the opposite side of the question, which ascribes to heat a distinct substantial existence, are the following.

Epicurus, Democritus, and most of the Greek philosophers, appear to have considered heat as material, and to have employed the term in a sense nearly synonymous with our use of the term caloric in the present day. Zeno, also, who lived early in the seventh century, has expressed a similar opinion; and Cicero, who was one of his disciples, has given a curious dissertation on this subject in his book De Natura Deorum: it consists of a dialogue (trialogue?) between an Epicurean, a Platonist, and a stoic, respecting the supreme power, &c. The stoic is made to speak of heat in the following terms. "That heat is combined with water, its liquefaction itself sufficiently proves; nor can it either freeze or congeal into snow or hoar frost without suffering that heat to escape. Even the air, however cold it may be, is by no means devoid of heat; indeed, it is combined with a great deal of heat," with many other expressions, similar to the language that has since been so generally used upon this occasion. Indeed this appears to have continued to be the prevailing, and almost only, opinion, as far as we can learn, respecting the nature of heat, till about the time of lord chancellor Bacon, who flourished in the sixteenth century, and to whose opinions reference has been already made. The chemical philosophers, however, of that and the succeeding period, seem to have retained a strong notion of the separate existence and materiality of heat.

Homberg, who supposed that sulphur was the inflammable principle, considers fire, using the term synonymously with our caloric, as "one of the simple, primary, preexistent ingredients of all natural bodies." Essai du Souffre Principe.

According to Dr. s'Gravesande, it "enters into the composition of all bodies; is contained in all bodies; and may be separated or procured from all bodies, by rubbing them against each other, and thus putting their fire in motion. But fire is by no means generated by such motion." Elem. Phys.

Again; he observes, "fire naturally unites itself with bodies; and hence it is that a body brought near to the fire, grows hot, in which case it also expands and swells." Ibid. Further, after alluding to the fact of heating bodies by friction, which, he remarks, "shews that all bodies have fire in them;" adds, that though "fire may be put in motion, and separated by such rubbing, it can never be generated that way." Ibid. It may be proper to notice, in passing, the distinction that subsists between these writers and their opponents, with respect to the producibility or generation of heat. Those who deny the materiality of heat, assert that such a generation actually takes place on the friction or collision of bodies; while those who plead for the existence of heat as a distinct fluid contend, that the heat is not generated by such motion, but only separated, excited, or collected; having previously existed, though imperceptibly, in the body which yields it. To proceed: s'Gravesande, in further explanation of his sentiments, says "Heat in the hot body is an agitation of the parts of the body made by means of the fire contained in it; by such agitation a motion is produced in our bodies, which excites the idea of heat in our mind; so that heat in respect of us is nothing but that idea; and in the hot body, nothing but motion." Though the term heat is employed here in an intermediate sense between the cause and the sensation of heat, or rather as denoting at one time the sensation, and at another the effect on the body previous to the sensation, and productive of it; yet the cause of this series of effects is evidently asserted to be material. Further; "The minute parts of which a body consists being vehemently agitated by attrition, the application of external fire, or the like cause; the fire contained therein is separated from those particles, and turned loose in the body; where, by the attraction between the particles of fire and of the body, a mutual action arises, by which some parts are borne off from the body and carried away by the motion of the fire." Thus far s'Gravesande.

Lemery, the younger, agrees with the two last mentioned authors, in asserting the absolute and ingenerable nature of heat; but he extends his idea still further. Not contented to claim for it the character of an element to bodies, he endeavours to shew that it is "equally diffused through all space, is present in all places, in the void spaces, between bodies, as well as in the insensible interstices between their parts." Mem. de l'Acad. 1713. In this last sentiment he agrees also with Boerhaave, whose opinions, experiments, and reasonings, deserve to be considered more at large.

This excellent chemist and philosopher has appropriated one very long chapter of his Treatise on Chemistry to the discussion of this important subject. In this elaborate performance he has taken a more precise, varied, and extensive view of the origin, properties, nature, and modifications of heat, than any of his predecessors. He not only attended to the sentiments of other writers, but finding them inconsistent with each other, and unsatisfactory in determining the nature of this mysterious agent, he instituted a set of experiments entirely new, and more comprehensive than any that had before been undertaken for this purpose,

at the same time bringing into consideration a great number of facts, more or less known, and a variety of observations which had been made in different parts of the world.

By the term fire, the subject of his dissertation, Boerhaave evidently intends to denote the same substance which in modern times is denominated caloric; that is, the cause of heat, and of its phenomena. This fire, however, he divides into two kinds; the pure or elementary, and the vulgar or culinary fire; but as the only difference between these is, according to his own statement, a variation of the circumstances in which they appear, it will be attended with no inconvenience, and some advantage, to treat the subject at present only in its elementary signification.

As the result of his enquiries, he infers, 1st. that fire appears to be the general instrument of all the motion in the universe; the universal cause of all the changes in nature. Of this he gives several instances in the effects of fire upon solids and fluids. All natural motion, he observes, is performed either by a separating of parts from each other, or by a rarefying of them, neither of which is done without fire. He remarks the impossibility of separating fire entirely from any body in nature, asserts that the most rarefied air contains a portion of it; and that, if it could be entirely deprived of this portion, it would become solid, perfectly at rest, and incapable of change. He stiles fire (or caloric) the only active and proper instrument of chemistry, without which the chemist would be absolutely incapable of performing or producing any thing.

2. That elementary fire is equally diffused in all places. The proofs he adduces in support of this, though ingeniously applied, appear to be only decisive as far as they shew that no body has yet been found, or can be conceived, totally destitute of caloric, and that amidst all the changes which are perpetually occurring, and the inequalities observable throughout nature, there is a constant tendency in fire to obtain and preserve an equilibrium amongst the various bodies which contain it.

3. That elementary fire is always latent, until set at liberty by some variation of circumstance; and that it then discovers itself by one or more of these effects, rarefaction, light, colour, heat, and burning.

4. That fire only becomes apparent by being collected, or gathered nearer together; "so that there is no exciting, producing, or making of fire, or even putting it in motion; but the whole of what we do is to collect what was before dispersed, and bring it into a narrower compass." From the whole he deduces the 5th or general inference, that fire, or caloric, "is a body *sui generis*, not creatable, or producible *de novo*, by any natural or artificial means;" that "its quantity is fixed and invariable;" and that "the utmost we can do with it, and which has led us to think it producible, is" that, from a state of insensibility, we can "render it sensible; where, before, there was no sign of it, it may be made manifest. But this is only effected by determining and collecting it; by bringing it out of a larger space into a less; and driving or directing it upon this body or that," &c.

Having inferred the materiality of heat, our author proceeds to investigate its properties, which he lays down in the following manner. As corporeal, it is composed of particles, which are extended, impenetrable, moveable, figurable, &c.; these corpuscles or molecules are the minutest and subtilest of bodies; the most solid and indivisible; the most polished and smooth; the most simple and immutable; and move with greater velocity than any other body we are acquainted with. In the prosecution of his enquiry, our author proceeds to notice the different modes of collecting fire, both elementary and vulgar, such as attrition, burning glasses, the putrefaction of vegetables, chemical admixture, contiguity of air, pulverizing, moistening and mixing certain solid bodies, &c.; the different kinds of pabulum, or food of fire, in other words combustible bodies, all the variety of which he reduces radically to two, oil and sulphur; the different effects of fire, according to its different circumstances, degrees, and directions, &c. &c.; never failing, as he goes along, to seize and apply fresh arguments as they present themselves, in support of his favourite notion of the materiality of heat.

Notwithstanding, however, the general excellence of Boerhaave's treatise, the attentive reader will discover some examples of inconsistency, and even of paralogism; some conclusions too hastily drawn, and a few, perhaps, even contradicted by the premises themselves. But these occur rarely, and if it be added that some of his reasonings are nullified by subsequent discoveries, the great improvements that have been made in chemical philosophy since he lived, will suggest an ample apology for his stopping short of infallibility and perfection. It deserves to be remarked, in taking leave of this eminent writer, that a pas... ... ready quoted, and another which follows, appear to contain the germ of that doctrine, which was afterwards so beautifully expanded by Dr. Black, under the denomination of *latent heat*. "Though fire," says he, "be the great cause of fluidity and motion, yet is it frequently found in such small quantity, that instead of fusing bodies, or keeping them in a state of fusion, it becomes enclosed and fixed therein, so as to remain, as it were, imprisoned, till some external cause come to its assistance, and open the cells which before detained it." In what respects Dr. Black's idea differed from this may be seen stated in the articles CAPACITY, CALORIC, and LATENT HEAT. See also PHLOGISTON.

Since the time of Boerhaave, other writers have appeared on the same side of the question. The French chemists who succeeded Macquer have almost generally declared themselves in favour of the materiality of heat: we may instance, particularly, Berthollet, Lavoisier, Guyton de Morveau, and Fourcroy, to whom we are indebted for the introduction of the term caloric, as well as for the formation of the nomenclature itself. To quote these, and other French authors, largely our limits would not admit; and it is the less necessary as most of their writings are easily accessible to those who make chemistry the object of their pursuit. One extract, however, we may venture to transcribe from Fourcroy, because, though it does not reveal for the first time any great discovery, it notices a fact of some consequence in the argument, and which we have not presented be! From the phenomena which he has described, it follows, he says, "that caloric has different attractions, or various degrees of affinity for different bodies." And this attraction, he adds, "varying for each body, is a direct proof of the existence of caloric, and a refutation of the doctrine

which makes it to consist only in a modification of bodies." Chem. Philos.

Professor Pictet, Scheele, and others, have shewn that caloric is radiated, refracted, and reflected, in the same manner as the rays of light, and therefore that if the one be a substance, so must the other likewise.

In our own country many writers have recently appeared, who have thrown much light on this intricate subject. Dr. Herschell discovered that there are rays emitted from the sun which produce heat, but have not the power of illuminating; and that, on the contrary, from the same source proceed also rays of light which do not produce heat. The last fact was indeed known long ago by Dr. Hooke and Mr. Scheele; but Dr. Herschell demonstrated it with more precision: and the first has been confirmed by sir Henry Englefield, who repeated the doctor's experiments with a different apparatus, but with the same results. This division of the solar rays into calorific and luminous, established as it is upon such undoubted premises, Dr. Thomson considers as nearly putting an end to the dispute by demonstrating the existence of caloric as a peculiar substance; at least it is putting it upon the same footing in this respect as light, the materiality of which is not disputed by many who argue on the other side with regard to heat. Chemistry, I. 299.

Mr. Tilloch, the editor of the Philosophical Magazine, has inserted in that useful work two very ingenious papers on the subject of caloric; in the first of which he advances several objections against the distinction between sensible and latent heat (see CALORIC in this work, § V.); and in the second, with which alone we are concerned at present, he attempts to prove that "the matter of heat, like other substances, possesses not only volume, but gravity." He brings forward many examples, most of which are well known, to shew that in a great number of cases, mixtures of different kinds, of aeriform and fluid bodies among themselves, with each other, and with solids, are reduced or increased in volume, without parting with or receiving any thing except heat; and therefore he concludes that heat is matter. Again; with respect to its gravity, he thinks the experiments and facts commonly adduced to prove that it is devoid of weight are by no means conclusive; indeed, he conceives that many of them are inexplicable without allowing it to possess weight, though we are not at present in possession of means to ascertain that weight exactly. For ourselves, we must confess that ideas of this kind have frequently been excited in our own minds on the contemplation of various chemical phenomena; and we are not without hopes that some future attempt to determine the weight of heat will be so far successful as to set that part of the question entirely at rest. Nothing that has yet been done, without excepting count Rumford's careful experiments, ought, in our estimation, to be looked upon as decisive, especially on the negative side of the enquiry.

Mr. Tilloch is of opinion that the methods hitherto adopted to settle the point are totally unfit for the purpose: they appear to him no more rational than it would be "for the inhabitants of the ocean to attempt to weigh water by employing a balance suspended in the medium that surrounds them, and putting into one shell a substance that to them should seem wet, and into the other a substance which they might call dry." After noticing the advantages, in determining the specific gravities of bodies, of weighing them both in the air and in water, and comparing their results; he asks, with reference to heated bodies, "why has the increase of absolute weight not been hitherto observed? I take the reason," he answers, "to be this: they attempted to determine it in the air; overlooking this plain fact, namely, that air may be considered as bearing the same relation to heat that water does to gold, or rather to a substance many times heavier, if such could be found; that is the air, though a rarer substance than the solid bodies weighed in it, is a denser one than heat; and they have been demanding that a substance specifically lighter than air should descend in it." P. M. vol. IX. Without taking upon ourselves to answer for the perfect accuracy of Mr. T.'s representations and reasonings in all cases, the paper contains so much that is worthy of attention in this enquiry, that we cannot but recommend it to the perusal of our readers.

Another correspondent, in the same work, vol. XII. has made some remarks to shew that the hypothesis which makes all heat to be generated by motion is utterly inconsistent with many of its phenomena, and especially with the fact discovered by count Rumford, and confirmed thus far by later experiments; that heat is conveyed, especially by fluids, with much greater difficulty downwards than upwards. He allows however the difficulty of explaining count Rumford's experiment with the brass cylinder, consistently with the doctrine of materiality, and contends that a single instance of inability to account for a fact ought not to overturn any doctrine that is otherwise well established; but Mr. Tilloch remarks, in a note, that the count, with all the care and precaution he employed, did not succeed in insulating from the contact of caloric the bodies subjected to friction. "Was not the apparatus," he asks, "wholly immersed in a bath of caloric—the atmosphere?" P. 321.

In the fifth volume of the Manchester Memoirs, Dr. W. Henry has a paper, entitled "A Review of some Experiments which have been supposed to disprove the Materiality of Heat." This paper was written soon after the publication of count Rumford's Enquiry concerning the Source of Heat evolved by Friction, and of Mr. Davy's interesting Essays in Dr. Beddoes's Contributions; and the remarks it contained were intended principally to apply to the arguments advanced by these two able philosophers, and to the facts which served as bases to their reasoning. The materiality of caloric, Dr. Henry contends, may be maintained without admitting that we have made any steps towards determining its quantity in bodies. Avoiding all metaphysical reasoning on the nature of matter, and assuming the generally received definition of matter as sufficiently characterizing it, he examines how far this general character applies to the individual—caloric. "Caloric," he argues, "occupies space, or is extended, because it enlarges the dimensions of other bodies; and, for the same reason, it is impenetrable, since if it could exist at the same time in the same place with other bodies, their volume would never be enlarged by the addition of heat. Of form, or figure, as only a mode of extension, it is unnecessary to prove that caloric is possessed; and, indeed, there is perhaps only one general quality of matter that will not be allowed it, viz. attraction. That caloric is influenced by the attraction of gra-

vitation, or by cohesive attraction, has never yet been proved; yet the various experiments of Buffon, Whitehurst, Fordyce, Pictet, &c. cannot be alleged as proofs that it is actually devoid of this property; since they only decide, that the small quantities which can be artificially collected are not to be set in the balance against the grosser kinds of matter. One kind of attraction, that which has lately been termed chemical affinity, may, I think, after a full survey of phenomena, be fairly predicated of caloric; and if its possession of this quality be rendered probable, we shall thence derive a powerful argument in favour of its materiality."

To those who contend that heat is generated by motion, he replies that, if the phenomena of heat can be shewn to take place where matter is not present; that is, we suppose, any thing which is allowed to be matter by the advocates of the immaterial hypothesis; we shall derive from the fact a conclusive argument against that hypothesis. Such a fact, he remarks, is afforded by an experiment of count Rumford himself, in which heat was observed to pass through a Torricellian vacuum, in which, if heat be not matter, there could be nothing to transport or propagate motion; thus proving that heat can exist independently of other matter, and consequently that it is a distinct and peculiar body.

Such are the outlines of the controversy respecting the nature of heat, and such are the principal arguments by which the advocates on each side support their opinions. Those who are desirous of pursuing the enquiry further may consult Dr. Crawford's Experiments and Observations on Animal Heat and the Inflammation of Combustible Bodies; Scheele's Experiments on Air and Fire, with Mr. Kirwan's notes; Leslie on Heat; Thomson's Chemistry, vol. I.; Boerhaave's Chemistry, and Davy's Essays, before referred to; Rumford's Essays, and various papers of his in the Philosophical Transactions; several of Dr. Herschell's Papers in the same work; several volumes of the Philosophical Magazine, and of Nicholson's Journal, to specify which is unnecessary, as those who have sets of those very useful works may easily be directed to those papers which relate to the subject, by consulting their respective indexes.

HEAT (Animal). See PHYSIOLOGY.

HEAT (Latent). See the end of the article CALORIC, also LATENT HEAT. We may just notice here a difference of conception on this point between two eminent philosophers: Dr. Irvine, of Glasgow, ascribes the disappearance of heat, without increase of temperature, to a change of capacity in bodies; while Dr. Black, the great illustrator of this doctrine, supposes caloric to become latent by a chemical combination with bodies. See a letter from the son of Dr. Irvine, in Nicholson's Journal, New Series, VI. 25.

HEAT (Propagation of). See PROPAGATION.

HE'ATER. *s.* (from *heat.*) An iron made hot, and put into a box-iron to smooth linen.

HEATH. *s.* (*erica*, Latin.) 1. A shrub of low stature (*Miller*). 2. A place overgrown with heath (*Shakspeare*). 3. A place covered with shrubs of whatever kind (*Bacon*).

HEATH, in botany. See ERICA.

HEATH (Mountain). See SAXIFRAGA.

HEATH (African). See PHYLICA.

HEATH (Berry-bearing). See EMPETRUM.

HEATH (Pea). See OROBUS.

HEATH-FOWL, a variety of grouse denominated black game, specially protected by the game laws. Thus by 13 Geo. III. c. v. § 2. no person shall kill, destroy, carry, sell, buy, or have in his possession, any heath-fowl, commonly called black game, between the tenth day of December and the twentieth day of August; or any grouse, commonly called red game, between the tenth day of December and the twelfth day of August; or any bustard between the first day of March and the first day of September, in any year, upon pain of forfeiting, for the first offence, a sum not exceeding twenty, nor less than ten pounds; and for the second, and every subsequent offence, a sum not exceeding thirty, nor less than twenty pounds: one moiety thereof to go to the informer, the other to the poor of the parish.

HEA'THEN. *s.* (*heyden*, German.) The gentiles; the pagans; the nations unacquainted with the covenant of grace (*Addison*).

HEA'THEN. *a.* Gentile; pagan (*Addison*).

HEA'THENISH. *a.* (from *heathen*) 1. Belonging to the gentiles (*Hooker*). 2. Wild; savage; rapacious; cruel (*South*).

HE'ATHENISHLY. *ad.* After the manner of heathens.

HE'ATHENISM. *s.* (from *heathen.*) Gentilism; paganism (*Hammond*).

HE'ATHY. *a.* (from *heath.*) Full of heath.

To HEAVE. *v. a.* pret. *heaved*, anciently *hove*; part. *heaved* or *hoven*. 1. To lift; to raise from the ground (*Milton*). 2. To carry (*Shakspeare*). 3. To raise; to lift (*Dryden*). 4. To cause to swell (*Thomson*). 5. To force up from the breast (*Shakspeare*). 6. To exalt; to elevate (*Shakspeare*). 7. To puff; to elate (*Hayward*).

To HEAVE. *v. n.* 1. To pant; to breathe with pain (*Dryden*). 2. To labour (*Atter.*). 3. To rise with pain; to swell and fall (*Dry.*). 4. To keck; to feel a tendency to vomit.

HEAVE. *s.* (from the verb.) 1. Lift; exertion or effort upward (*Dryden*). 2. Rising of the breast (*Shakspeare*). 3. Effort to vomit. 4. Struggle to rise (*Hudibras*).

HEAVE OFFERING. *s.* An offering among the Jews (*Numbers*).

HEA'VEN. *s.* (heofon, Saxon.) 1. The regions above; the expanse of the sky. 2. The habitation of God, good angels, and pure souls departed (*Milton*). 3. The supreme power; the sovereign of heaven (*Temple*). 4. The pagan gods; the celestials (*Shakspeare*). 5. Elevation; sublimity (*Shakspeare*).

HEAVEN is more particularly used, in astronomy, for an orb, or circular region, of the æthereal heaven. The ancient astronomers assumed as many different heavens as they observed different motions therein. These they supposed all to be solid, as thinking they could not otherwise sustain the bodies fixed in them; and spherical, that being the most proper form

for motion. Thus we had seven heavens for the seven planets; viz. the heavens of the Moon, Mercury, Venus, the Sun, Mars, Jupiter, and Saturn. The eighth was for the fixed stars, which they particularly called the firmament. Ptolemy adds a ninth heaven, which he called the primum mobile. After him two crystalline heavens were added, by king Alphonsus, &c. to account for some irregularities in the motions of the other heavens: and lastly, an empyrean heaven was drawn over the whole, for the residence of the Deity; which made the number twelve. But others admitted many more heavens, according as their different views and hypotheses required. Eudoxus supposed 23, Calippus 30, Regiomontanus 33, Aristotle 47, and Fracastor no less that 70.

Heaven-born. Descended from the celestial regions; native of heaven (*Dryden*).

Heaven-bred. Produced or cultivated in heaven (*Shakspeare*).

Heaven-built. Built by the agency of gods (*Pope*).

Heaven-directed. 1. Raised toward the sky (*Pope*). 2. Taught by the powers of heaven (*Pope*).

HE'AVENLY. *a.* (from *heaven.*) 1. Resembling heaven, supremely excellent (*Sid.*). 2. Celestial: inhabiting heaven (*Dryden*).

He'avenly. *ad.* 1. In a manner resembling that of heaven. 2. By the agency or influence of heaven.

HE'AVENWARD. *ad.* (*heaven* and peaꞃꝺ, Saxon.) Toward heaven (*Prior*).

HEAVIER. A stag deprived of his testicles by castration: an operation occasionally performed, in order that a supply may not be wanting for the chase during the time of rutting; in which the stag is perpetually ranging from one hind to another, for three weeks or longer; not allowing himself the comforts of food, sleep, or rest. Towards the termination of this copulative period he becomes lean, languid, and dejected; and withdraws himself from society, to seek repose and food. So debilitated and ill-adapted is he for sport, that the operation of castrating has been occasionally employed to prevent him from thus falling a prey to venereal pleasures and to preserve him for the chase.

It is worthy of remark, that if a stag undergo the operation when his horns are shed, they never grow again; on the contrary, if it be performed while the horns are in perfection, they will never be shed at all; and it is equally remarkable, that on being deprived of only one testicle, the horn will not regenerate on that side, but will continue to grow, and shed on the other side, in which the testicle remains perfect. Heaviers are of great strength, and stand a long time before hounds; for which reason the hunting establishment of his majesty in Windsor forest is never without a regular succession.

HE'AVILY. *ad.* (from *heavy.*) 1. With great ponderousness. 2. Grievously; afflictively (*Collier*). 3. Sorrowfully; with grief (*Cla.*

HE'AVINESS. *s.* (from *heavy.*) 1. Ponderousness; the quality of being heavy; weight (*Wilkins*). 2. Dejection of mind; depression of spirit (*Shakspeare*). 3. Inaptitude to motion or thought (*Arbuthnot*). 4. Oppression; crush; affliction. 5. Deepness or richness of soil (*Arbuthnot*).

HE'AVY. *a.* (heaꝼiᵹ, Saxon.) 1. Weighty; ponderous; tending strongly to the centre (*Wilkins*). 2. Sorrowful; dejected; depressed (*Shakspeare*). 3. Grievous; oppressive; afflictive (*Swift*). 4. Wanting alacrity; wanting briskness of appearance (*Prior*). 5. Wanting spirit or rapidity of sentiment; unanimated (*Swift*). 6. Wanting activity; indolent; lazy (*Dryden*). 7. Drousy; dull; torpid (*Luke*). 8. Slow; sluggish (*Shakspeare*). 9. Stupid; foolish (*Knolles*). 10. Burdensome; troublesome; tedious (*Swift*). 11. Loaded; incumbered; burdened (*Bacon*). 12. Not easily digested (*Arbuthnot*). 13. Rich in soil; fertile: as *heavy* lands. 14. Deep; cumbersome: as *heavy* roads.

He'avy. *ad.* As an adverb it is only used in composition; heavily (*Matthew*).

Heavy spar, in oryctology. See Barytes.

HE'BDOMAD. *s.* (*hebdomas*, Lat.) A week; a space of seven days (*Brown*).

HEBDO'MADAL. Hebdo'madary. *a.* (from *hebdomas*, Lat.) Weekly; consisting of seven days (*Brown*).

HEBDOME, a festival observed by the Athenians, on the seventh day of every month, in honour of Apollo.

HEBE, in fabulous history, daughter of Jupiter and Juno, and according to some, of Juno only, who conceived her after eating lettuces. As she was fair, and always in the bloom of youth, she was called the goddess of youth, and made by her mother cup-bearer to all the gods. Ganymedes, however, succeeded her as cup-bearer, in consequence of her having fallen when she was serving the nectar. She was employed by her mother to prepare her chariot, and to harness her peacocks whenever requisite. When Hercules was raised to the rank of a god, he married Hebe, by whom he had two sons, Alexiares and Anicetus. As Hebe had the power of restoring gods and men to the vigour of youth, she, at the instance of her husband, performed that kind office to Jolas his friend. She is represented as a young virgin crowned with flowers, and arrayed in a variegated garment. In Greece and Rome she was worshipped under the name Dia and Juventas.

To HE'BETATE. *v. a.* (*hebeto*, Latin.) To dull; to blunt; to stupify (*Arbuthnot*).

HEBETA'TION. *s.* (from *hebetate.*) 1. The act of dulling. 2. The state of being dulled.

HE'BETUDE. *s.* (*hebetudo*, Latin.) Dulness; obtuseness; bluntness (*Harvey*).

HE'BRAISM. *s.* (*hebraisme*, French; *hebraismus*, Latin.) A Hebrew idiom (*Addison*).

HE'BRAIST. *s.* (*hebræus*, Latin.) A man skilled in Hebrew.

HEBREW, something relating to the Hebrews or Jews; as Hebrew bible.

Hebrew character. There are two kinds of Hebrew characters: the ancient, called also the square; and the modern, or rabbinical characters. The square Hebrew takes its denomination from the figure of its characters, which stand more square, and have their angles more exact and precise than the other.

This character is used in the text of holy Scripture, and their other principal and most important writings. When both this and the rabbinical character are used in the same work, the former is for the text, or the fundamental part; and the latter for the accessory part; as the gloss, notes, commentaries, &c.

The best and most beautiful characters of this kind, are those copied from the characters in the Spanish manuscripts; next, those from the Italian manuscripts; then those from the French; and lastly, those of the Germans, whose characters are much the same, with respect to the other genuine square Hebrew characters, that the Gothic, or Dutch characters, are with respect to the Roman.

Several authors contend that the square character is not the real ancient Hebrew character, written from the beginning of the language to the time of the Babylonish captivity; but that it is the Assyrian, or Chaldee character, which the Jews assumed, and accustomed themselves to, during the captivity, and retained afterwards. They say, that the Jews, during their captivity, having quite disused their ancient character, so that Ezra found it necessary to have the sacred books transcribed into the Chaldean square character. These authors add, that what we call the Samaritan character is the genuine ancient Hebrew.

Hebrew character (Modern or rabbinical), is a good neat character, formed of the square Hebrew, by rounding it, and retrenching most of the angles or corners of the letters, to make it the more easy and flowing. The letters used by the Germans are very different from the rabbinical character used every where else, though all formed alike from the square character; but the German in a more slovenly manner than the rest.

The rabbins frequently make use either of their own, or the square Hebrew character, to write the modern languages in. There are even books in the vulgar tongues printed in Hebrew characters; instances whereof are seen in the French king's library.

Hebrew language, that spoken by the Hebrews, and wherein almost all the books of the Old Testament is written. This appears to be the most ancient of all the languages in the world, at least we know of none older; and some learned men are of opinion, that this is the language in which God spoke to Adam in Paradise. Dr. Sharpe adopts the opinion that the Hebrew was the original language; not indeed that the Hebrew is the unvaried language of our first parents, but that it was the general language of men at the dispersion; and however it might have been improved and altered from the first speech of our first parents, it was the original of all the languages, or almost all the languages, or rather dialects, that have since arisen in the world.

The books of the Old Testament are the only pieces to be found, in all antiquity, written in pure Hebrew; and the language of many of these is extremely sublime: it appears perfectly regular, and particularly so in its conjugations. Indeed, properly speaking, it has but one conjugation; but this is varied in each seven or eight different ways, which has the effect of so many different conjugations, and affords a great variety of expressions to represent by a single word the different modifications of a verb, and many ideas which in the modern and in many of the ancient and learned languages cannot be expressed without a periphrasis.

The primitive words, which are called roots, have seldom more than three letters or two syllables.

In this language there are twenty-two letters, only five of which are usually reckoned vowels, which are the same with ours, viz. *a*, *e*, *i*, *o*, *u*; but then each vowel is divided into two, a long and a short, the sound of the former being somewhat grave and long, and that of the latter short and acute: it must however be remarked, that the two last vowels have sounds that differ in other respects besides quantity and a greater or less elevation. To these ten or twelve vowels may be added others, called semi-vowels, which serve to connect the consonants, and to make the easier transitions from one to another. The number of accents in this language are indeed prodigious: of these there are near forty, the use of some of which, notwithstanding all the inquiries of the learned, are not yet perfectly known. We know, in general, that they serve to distinguish the sentences like the points called commas, semicolons, &c. in our language; to determine the quantity of the syllables; and to mark the tone with which they are to be spoken or sung. It is no wonder then that there are more accents in the Hebrew than in other languages, since they perform the office of three different things, which in other languages are called by different names.

As we have no Hebrew but what is contained in the Scripture, that language to us wants a great many words; not only because in those primitive times the languages were not so copious as at present; but also on this account, that the inspired writers had no occasion to mention many of the terms that might be in the language.

The Chaldee, Syriac, Ethiopic, &c. languages, are by some held to be only dialects of the Hebrew; as the French, Italian, Spanish, &c. are dialects of the Latin. It has been supposed by many very learned men, that the Hebrew characters or letters were often used hieroglyphically, and that each had its several distinct sense understood as a hieroglyphic. Nenmann took infinite pains to find out the secret meaning of these letters: but the enquiry is too trifling to be pursued here.

Hebrew (Rabbinical or Modern), is the

language used by the rabbins in the writings they have composed. The basis or body hereof is the Hebrew and Chaldee, with divers alterations in the words of these two languages, the meanings whereof they have considerably enlarged and extended. Abundance of things they have borrowed from the Arabic; the rest is chiefly composed of words and expressions, chiefly from the Greek; some from the Latin; and others from the other modern tongues, particularly that spoken in the place where each rabbin lived or wrote.

The rabbinical Hebrew must be allowed to be a very copious language. M. Simon, in his Hist. Crit. du Vieux Testam. liv. iii chap. 27, observes, that there is scarce any art or science that the rabbins have not treated of in it. They have translated most of the ancient philosophers, mathematicians, astronomers, and physicians; and have written themselves on most subjects: they do not want even orators and poets. Add, that this language, notwithstanding it is so crowded with foreign words, has its beauties visible enough in the works of those who have written well in it.

Hebrews, the descendants of Heber, commonly called Jews.

of the New Testament. It was written, according to the best critics, to the Jewish believers at Jerusalem and in Judea: and the writer is generally believed to have been St. Paul, who is thought to have had particular reasons for concealing his name in this epistle; since the circumstances of the time might render a disclosure of it offensive and improper. Dr. Lardner supposes this epistle to have been written at Rome or in Italy soon after Paul had been released from his confinement, about the beginning of the year 63. In what language it was originally written is a matter of dispute: the critic last mentioned, with others of note, thinks it was in Greek: M. Michaelis, that it was in Hebrew or Syriac.

The manifest design of Paul in this epistle was to confirm the Jewish Christians in the faith and practice of the gospel of Christ, which they might be in danger of deserting either through the insinuations or ill-treatment of their persecutors. With this view the apostle, 1st. obviates the insinuations and objections of the Jews to the gospel of Christ, as inferior to the Mosaic dispensation, by shewing its transcendent excellence over it in every article (to chap. x. 25). 2dly. He prepares them to encounter persecution, which they had partly felt, and were to expect in a still higher degree, by reminding them of many renowned examples of faith and fortitude (to chap. xii. 2), and by other the most cogent exhortations and cautions.

HEBRICIAN. *s.* (from *Hebrew.*) One skilled in Hebrew (*Raleigh*).

HEBRIDES, or Western Isles, a name given to a great number of islands, situated in the North Atlantic Ocean, to the west of Scotland. Pliny, who reckoned the number to be thirty, is considered to be pretty near the truth. The principal are Lewis, North and South Uist, Skye, Benbecula, Mull, and Jura. These islands were anciently called Ebude, and afterwards Hebrides. As the history of these islands is not much known, we presume a short sketch will not be unacceptable. The inhabitants had probably, for some ages, their own governors: one little king to each island, or to each group, as necessity required. It is reasonable to suppose that their government was as much divided as that of Great Britain, which, it is well known, was under the direction of numbers of petty princes, before it was reduced under the power of the Romans. In the year 1089, is an evident proof of the independency of the islanders on Norway: for, on the death of Lagman, one of their monarchs, they sent a deputation to O'Brian, king of Ireland, to request a regent of royal blood to govern them during the minority of their young prince. They probably might in turn compliment in some other respects their Scottish neighbours: the islanders must have given them some pretence to sovereignty, for, in the year 1093, Donald-bane, king of Scotland, called in Magnus the Barefooted, king of Norway, and bribed him by a promise of all the islands; Magnus accepted the terms, but, at the same time, boasted that he did not come to invade the territories of others, but to resume the ancient rights of Norway. His conquests were rapid and complete, for besides the islands, by an ingenious fraud he added Kintyre to his dominions. In the thirteenth century, however, they were ceded to Scotland, but Scotland seems to have received no real acquisition of strength: the islands still remained governed by powerful chieftains, the descendants of Somerled, thane of Heregaidel or Argyle, who, marrying the daughter of Olave, king of Man, left a divided dominion to his sons Dugal and Reginald: from the first were descended the Mac-dougals, of Lorn, from the last powerful clan of the Macdonalds. The lordship of Argyle, with Mull, and the islands north of it, fell to the share of the first; Ilay, Kintyre, and the southern isles, were the portion of the last: a division that formed the distinction of the Sodereys and Nordereys. These chieftains were the scourges of the kingdom; they are known in history, but as the devastations of a tempest: for their paths were marked with the most barbarous desolation. Encouraged by their distance from the seat of royalty, and the turbulence of the times, which gave their monarchs full employ, they exercised a regal power, and often assumed the title; but are more generally known in history by the style of the lords of the isles or the earls of Ross; and sometimes by that of the Macdonalds. Historians are silent about their proceedings, from the retreat of the Danes, in the year 1263, till that of 1335, when John, lord of the isles, withdrew his allegiance. In the beginning of the next century, his successors were so independent, that Henry IV. entered into a formal alliance with the brothers, Donald and John; this encouraged them to commit fresh hostilities against their natural

prince. Donald, under pretence of a claim to the earldom of Ross, invaded and made a conquest of that country; but penetrating as far as the shire of Aberdeen, after a fierce but undecisive battle with the royal party, thought proper to retire, and in a little time to swear allegiance to his monarch, James I. But he was permitted to retain the county of Ross, and assume the title of earl. His successor, Alexander, at the head of ten thousand men, attacked and burned Inverness; at length, terrified with the preparations made against him, he fell at the royal feet, and obtained pardon as to life, but was committed to strict confinement. His kinsman and deputy, Donald Balloch, resenting the imprisonment of his chieftain, excited another rebellion, and destroyed the country with fire and sword: but on his flight was taken and put to death by an Irish chieftain, with whom he sought protection. In the reign of James II. in the year 1461, Donald, another petty tyrant, an earl of Ross, and lord of the isles, renewed the pretence of independence, surprised the castle of Inverness, forced his way as far as Athol, obliged the earl and countess, with the principal inhabitants, to seek refuge in the church of St. Bridget, in hopes of finding security from his cruelty by the sanctity of the place; but the barbarian and his followers set fire to the church, put the ecclesiastics to the sword, and, with a great booty, carried the earl and countess prisoners to his castle of Claig, in the island of Ilay. In a second expedition, immediately following the first, he suffered the penalty of his impiety: a tempest overtook him, and overwhelmed most of his associates; and he, escaping to Inverness, perished by the hands of an Irish harper; his surviving followers returned to Ilay, conveyed the earl and countess of Athol to the sanctuary they had violated, and expiated their crime by restoring the plunder, and making donations to the shrine of the offended saint. John, successor to the last earl of Ross, entered into alliance with Edward IV. sent ambassadors to the court of England, where Edward empowered the bishop of Durham and earl of Winchester to conclude a treaty with him, another Donald Balloch, and his son and heir John. They agreed to serve the king with all their power, and to become his subjects: the earl was to have a hundred marks sterling for life, in time of peace, and two hundred pounds in time of war; and these island allies, in case of the conquest of Scotland, were to have confirmed to them all the possessions north of the Scottish Sea; and in case of a truce with the Scottish monarch, they were to be included in it. But about the year 1476, Edward, from a change of politics, courted the alliance of James III. and dropped his new allies. James, determined to subdue this rebellious race, sent against them a powerful army, under the earl of Athol, and took leave of him with this good wish, "Furth, fortune, and fill the fetters;" as much as to say, go forth, be fortunate, and bring home many captives: which the family of Athol have used ever since for their motto. Ross was terrified into a submission; obtained his pardon, but was deprived of his earldom, which, by act of parliament, was then declared unalienably annexed to the crown; at the same time the king restored to him Knapdale and Kintyre, which the earl had resigned, and invested him anew with the lordship of the isles, to hold them of the king by service and relief. Thus the great power of the isles was broken; yet, for a considerable time after, the petty chieftains were continually breaking out into small rebellions, or harassed each other in private wars, and tyranny seems but to have been multiplied. James V. found it necessary to make the voyage of the isles in person in the year 1536; seized and brought away with him several of the most considerable leaders, and obliged them to find security for their own good behaviour, and that of their vassals. He examined the titles of their holdings, and finding several to have been usurped, reunited their lands to the crown. In the same voyage he had the glory of causing a survey to be taken of the coasts of Scotland and of the islands, by his pilot, Alexander Lindesay, which were published in the year 1583, at Paris, by Nicholas Nicholay, geographer to the French monarch. The troubles that succeeded the death of James occasioned a neglect of these insulated parts of the Scottish dominions, and left them in a state of anarchy. In the year 1614, the Macdonalds made a formidable insurrection, opposing the royal grant of Kintyre to the earl of Argyle, and his relations. The petty chieftains continued in a sort of rebellion, and the sword of the greater, as usual in weak governments, was employed against them: the encouragement and protection given by them to pirates, employed the power of the Campbels during the reign of James VI. and the beginning of that of Charles I. An act of parliament, passed in the year 1748, to abolish heritable jurisdictions, &c. has deprived the chieftains of the power of doing so much mischief in future. They are now quiet and good subjects. See LEWIS, SKYE, MULL, JURA, ST. KILDA, &c.

HEBRIDES (New), a cluster of islands in the South Pacific Ocean, first discovered by Quiros in the year 1506, who supposed them to have been the southern continent, and called them Tierra Australia del Espirito Santo. Mons. Bourgainville landed on one of them in the year 1768; but they were not discovered to be a group of islands till captain Cook explored them in 1774. They are in general mountainous, and abound with wood and water. Their principal productions are bread-fruit, cocoa-nuts, plantains, yams, and sugar-canes. The inhabitants appear civil and hospitable. Lat. 14. 30 S. Lon. 166. 40 E.

HEBRON, a town of Palestine, situated partly on a hill and partly on a plain. The Christians have a church here, which they say contains the tombs of Abraham and Sarah, to which the Mahometans, as well as Christians, come in pilgrimage. The valley or plain of Mamre is not far from Hebron: it is fertile, and planted with excellent vineyards. Con-

stantine built a church here, the walls of which are yet in existence: eight leagues S.W. Jerusalem.

HEBRUS, in ancient geography, the largest river of Thrace, rising from mount Scombrus, and emptying itself at two mouths into the Ægean Sea, to the N. of Samothrace.

HECATE, in fabulous history, a daughter of Perses and Asteria, the same as Proserpine or Diana. She was called Luna in heaven, Diana on earth, and Hecate or Proserpine in hell, whence her name of Diva triformis, tergemina, triceps. She was supposed to preside over magic and enchantments. Dogs, lambs, and honey were generally offered to her, especially in cross roads, whence she obtained the name of Trivia. Her power was extended over heaven, the earth, sea, and hell.

HECATESIA, a yearly festival kept by the Stratoniceensians and Athenians in honour of Hecate.

HECATOMB, in antiquity, a sacrifice of an hundred beasts of the same kind, at an hundred altars, and by an hundred priests or sacrificers. The word is formed of the Greek εκατομβη, which properly signifies a sumptuous or magnificent sacrifice. Others derive it from the Greek εκατον, *centum*, a hundred, and βους, *bos*, bullock, &c.; on which footing the hecatomb should be a sacrifice of 100 bullocks. Others derive the word from εκατον and πους, *pes*, foot; and on that principle hold, that the hecatomb might consist of only 25 four-footed beasts. They add, that it did not matter what kind of beasts were chosen for victims, provided the quota of feet were but had. Pythagoras is said to have sacrificed a hecatomb to the muses, of 100 oxen, in joy and gratitude for his discovering that in a rectangled triangle the square of the hypothenuse is equal to the squares of the two other sides: but as he had an aversion to animal sacrifices, this tale cannot easily be credited.

HECATOMBÆON. See ECATOMBÆON.

HECATOMPHONIA, a solemn sacrifice offered by the Messenians to Jupiter when any of them had killed an hundred enemies.

HECATOMPOLIS, an epithet given to Crete, from the hundred cities which it once contained.

HECATOMPYLOS, an epithet applied to Thebes, in Egypt, on account of its hundred gates.

HECATONSTYLON, in ancient architecture, a porch with 100 columns.

HECKLE, among hemp-dressers. See HATCHEL.

HECLA (Mount), a mountain of Iceland, with a volcano, which frequently sends forth flames and torrents of burning matter. The eruptions in the year 1693 and 1766 occasioned terrible devastations, some of the matter being thrown forth to the distance of 150 miles, and a circuit of nearly fifty laid waste by the lava. It takes up four hours' time to ascend. On the highest point, where Fahrenheit's thermometer was at twenty-four in the air, it rose to 153 when placed on the ground. No persons ever ascended to the top of this mountain till the year 1772, when it was visited by Dr. Van Troil, a Swedish gentleman, sir Joseph Banks, Dr. Solander, and Dr. Lind of Edinburgh. They found about Hecla most kinds of lava to be met in other volcanic countries.

HE'CTIC. HE'CTICAL. *a.* (*hectique*, Fr.) 1. Habitual; constitutional (*Donne*). 2. Troubled with a morbid heat (*Taylor*).

HECTIC FEVER. See FEBRIS HECTICA.

HECTOR, in fabulous history, a son of king Priam and Hecuba, the most valiant of all the Trojan chiefs that fought against the Greeks. He married Andromache, the daughter of Eetion, by whom he had Astyanax. He was appointed chief commander of all the Trojan forces, when Troy was besieged by the Greeks. He engaged with the bravest of the Greeks in the different actions. When Achilles had driven back the Trojans towards the city, Hector waited the approach of his enemy near the Scæan gates. The sight of Achilles, however, terrified him, and he fled before him in the plain. The Greek pursued, and Hector was killed, and his body was dragged in cruel triumph by the conqueror round the tomb of Patroclus. Old Priam, after the greatest insult had been offered to the corpse, ransomed it. The epithet of Hectoreus is applied by the poets to the Trojans, as best expressive of valour and intrepidity.

HE'CTOR. *s.* (from *Hector*, the great Homeric warrior.) A bully; a blustering, turbulent, pervicacious, noisy fellow (*Prior*).

To HE'CTOR. *v. a.* (from the noun.) To threaten; to treat with insolent terms (*Arbuthnot*).

To HE'CTOR. *v. n.* To play the bully (*Swift*).

HECUBA, daughter of Dymas, a Phrygian prince, or according to others, of Cisseis, a Thracian king, was the second wife of Priam, king of Troy. When pregnant of Paris, she dreamed that she had brought forth a torch, which had reduced all Troy to ashes. The soothsayers declared that the son she should bring into the world would prove the ruin of his country. When Paris was born, she exposed him on mount Ida to avert the calamities threatened; but the prediction of the soothsayers was eventually fulfilled. After having had the misfortune to see the greatest part of her children perish by the hands of the enemy, she, when Troy was taken, fell to the lot of Ulysses, as one of the captors. She sailed for Greece, and in her voyage found on the Thracian coast the body of her son Polydorus, who had perished by the cruelty of Polymnestor, king of Thrace. She attempted to revenge the death of her son, but was prevented by being suddenly changed into a bitch. After this metamorphosis, it is said, she threw herself into the sea.

HEDAMORA, a town of Sweden, in Westmania, seated on the Dahl. Lat. 60. 14 N. Lon. 17. 7 E.

HE'DERA, in botany, ivy: a genus of the

class and order pentandria, monogynia. Calyx five-toothed; petals five, dilated at the base; berry five-seeded, surrounded by the calyx. Four species: two of Jamaica, H. pendula, and H. nutans; one of Ceylon, H. terebinthinacea; and one, H. helix, common to our own country, with five-angled, and five-lobed leaves; the floral leaves ovate; and with erect umbels. The leaves of this last have little or no smell, but a very nauseous taste. Haller informs us, that they are recommended in Germany against the atrophy of children. By the common people in this country they are sometimes applied to running sores, and to keep issues open. The berries were supposed by the ancients to have a purgative and emetic quality; and an extract was made from them by water, called by Quercetanus extractum purgans. Later writers have recommended them in small doses as alexepharmic and sudorific: it is said, that in the plague at London, the powder of them was given in vinegar or white wine with good success. It is from the stalk of this tree that a resinous juice exudes very plentifully in warm climates. See GUMMI HEDERÆ.

HEDERA TERRESTRIS. Ground-ivy, or gill. Glecoma hederacea; foliis reniformibus crenatis, of Linnéus. Class didynamia. Order gymnospermia. This indigenous plant has a peculiar strong smell, and a bitterish somewhat aromatic taste. It is one of those plants which were formerly much esteemed for possessing virtues that, in the present age, cannot be detected. In obstinate coughs it is a favourite remedy with the poor.

HEDERA'CEOUS. *a.* (*hederaceus*, Lat.). Producing ivy.

HEDGE. *s.* (heȝȝe, Saxon) A fence made round grounds with prickly bushes (*Pope*).

HEDGE, prefixed to any word, notes something mean, vile, of the lowest class (*Swift*).

To HEDGE. *v. a.* (from the noun.) 1. To enclose with a hedge (*Bacon*). 2. To obstruct (*Hosea*). 3. To encircle for defence (*Shak.*). 4. To shut up within an enclosure (*Locke*). 5. To force into a place already full (*Dryden*).

To HEDGE. *v. n.* To shift; to hide the head (*Shakspeare*).

HEDGE-BORN. *a.* Of no known birth; meanly born (*Shakspeare*).

HEDGE-HOG, in mastiology. See ERINACEUS.

HEDGE-HOG TREFOIL, in botany. See MEDICAGO.

HEDGE-HOG THISTLE, in botany. See CACTUS.

HEDGE-HOG HOLLY, in botany. See ILEX.

HEDGE-HOGGED PERICARP. In botany, echinatum pericarpium. Beset with prickles. A round prickly set of flowers, like a hedge-hog, is called echinus: a burr.

HEDGE-HOG HOOKED. In botany, echinato-uncinata spica. A spike beset with prickles which are hooked at the end.

HEDGE NETTLE (Shrubby). See PRASIUM.

HEDGE-NOTE. *s.* A word of contempt for low writing (*Dryden*).

HEDGE-PIG. *s.* A young hedge-hog (*Shakspeare*).

HEDGE-ROW. *s.* The series of trees or bushes planted for enclosures (*Milton*).

HEDGE-SPARROW, in ornithology. See MOTACILLA.

HEDGING-BILL. *s.* (*hedge* and *bill.*) A cutting hook used in making hedges (*Sidney*).

HE'DGER. *s.* (from *hedge.*) One who makes hedges (*Locke*).

HEDWI'GIA. In botany, a genus of the class octandria, order monogynia. Calyx four-toothed; corol tubular, four-cleft; capsule three-grained, three-celled; a nut in each cell. One species. A tree of Hispaniola, with alternate, pinnate leaves; terminal and axillary racemes.

HEDYCA'RIA. In botany, a genus of the class monœcia, order icosandria. Male: filamentless; anthers numerous, four-grooved, bearded at top. Fem.: germs pedicelled: stigmas papillæ scattered over the germ; nuts pedicelled, one seeded. One species only. A New Zealand shrub, with axillary racemes and sweet nuts.

HEDY'CHIUM. In botany, a genus of the class monandria, order monogynia. Calyx one-leafed, appearing as if broken: corol with a very long tube, and double three-parted border; nectary two-leaved. One species only; a native of India, with nodding corols much longer than the calyx.

HEDY'CREA. In botany, a genus of the class pentandria, order monogynia. Calyx five-toothed, inferior; corolless; drupe one-seeded, soft; nut one-seeded, covered with fibres. One species; a Guiana tree, with white flowers; and white fruit dotted with red, the size of an olive, and eatable.

HEDYO'SMUM. In botany, a genus of the class monœcia, order polyandria. Male: ament covered with anthers; perianthless; corolless, filamentless. Fem.: calyx three-toothed; corolless; style one, three-sided; berry three-sided, one-seeded. Two species, natives of Jamaica; one with a shrubby, the other with an arborescent stem.

HEDY'OTIS. In botany, a genus of the class tetrandria, order monogynia. Corol one-petalled, funnel-form; capsule two-celled, many seeded, inferior. Eleven species, chiefly of the East, a few of the West Indies. The only one entitled to notice is H. auricularia, a native of Ceylon, with alternate branches opposite, pendulous, entire lance-ovate, glabrous leaves and flowers in whorls; in common use among the inhabitants of neighbouring nations as a specific in cases of deafness.

HEDY'PNOIS. In botany, a genus of the class syngenesia, order polygamia æqualis. Receptacle naked; calyx invested with scales; down of the centre double; the outer of many obsolete bristles, inner of five chaffy leaves; of the ray a membranaceous denticulate margin. Five species, chiefly natives of the south of Europe.

HEDY'SARUM. In botany, a genus of the class diadelphia, order decandria. Calyx five-cleft; keel of the corol transversely obtuse;

loment jointed, the joints compressed and one-seeded. A hundred and seventeen species scattered over the four quarters of the globe, but the greater number natives of the East or West Indies. They may be subdivided as follow.

A. Leaves simple.

B. With a single pair of leaflets.

C Leaves ternate.

D. Leaves pinnate. See Nat. Hist. Pl CXXVII.

To HEED. *v. a.* (hedan, Saxon.) To mind; to regard; to take notice of, to attend (*Locke*).

HEED. *s.* (from the verb.) 1. Care; attention (*Addison*). 2. Caution: fearful attention; suspicious watch (*Shakspeare*). 3. Care to avoid (*Tillotson*). 4. Notice; observation (*Bacon*). 5. Seriousness: staidness (*Shak.*). 6. Regard: respectful notice (*L'Estrange*).

HE'EDFUL. *a.* (from *heed.*) 1. Watchful; cautious; suspicious (*Shak.*). 2. Attentive; careful; observing (*Pope*).

HE'EDFULLY. *ad.* Attentively; carefully; cautiously (*Watts*).

HE'EDFULNESS. *s.* (from *heedful.*) Caution; vigilance; attention.

HE'EDILY. *ad.* Cautiously; vigilantly.

HE'EDINESS. *s.* Caution; vigilance.

HE'EDLESS. *a.* (from *heed.*) Negligent; inattentive: careless; thoughtless (*Locke*).

HE'EDLESSLY. *ad.* Carelessly; negligently; inattentively (*Arbuthnot*).

HE'EDLESSNESS. *s.* (from *heedless.*) Carelessness; negligence; inattention (*Locke*).

HEEL. *s.* (hele, Saxon.) 1. The part of the foot that protuberates behind. (See ANATOMY). 2. The whole foot of animals (*Addison*). 3. The feet, as employed in flight (*L'Estrange*). 4. *To be at the* HEELS. To pursue closely; to follow hard (*Milton*). 5. *To lay by the* HEELS. To fetter; to shackle; to put in gyves (*Hudibras*). 6. Any thing shaped like a heel (*Mortimer*). 7. The back part of a stocking: whence the phrase *to be out at heels*, to be worn out.

To HEEL. *v. n.* (from the noun.) 1. To dance (*Shakspeare*). 2. To lean on one side; as, the ship *heels*.

To HEEL. *v. a.* To arm a cock.

HEEL OF A HORSE, the lowest hind-part of the foot, comprehended between the quarters and opposite to the toe.

HEEL-PIECE. *s.* (*heel* and *piece.*) A piece fixed on the hinder part of the shoe.

To HEEL-PIECE. *v. a.* To put a piece of leather on a shoe heel (*Arbuthnot*).

HEELER, in cock-fighting, the person who affixes the weapon called a spur made either of steel or silver to the heel of a game cock, when taken from the pen previously to his being carried to the cock-pit to fight his battle. A hard-hitting cock, that is perpetually fighting with effect, and giving his adversary no time to stand still, or look about him, is likewise called a heeler.

HEFT. *s.* (from *heave.*) 1. Heaving: effort (*Shakspeare*). 2. (for *haft.*) Handle (*Wall.*)

HEGIRA, a term in chronology, signifying the epoch, or account of time, used by the Mahomedans, who begin their computation from the day that Mahomet was forced to make his escape from the city of Mecca, which happened on Friday the 16th of July 622.

The years of the hegira are lunar ones, consisting only of 354 days. Hence, to reduce these years to the Julian calendar, that is, to find what Julian year a given year of the hegira answers to: reduce the year of the hegira into days, by multiplying by 354, divide the product by 365¼, and to the quotient add 622, the year the hegira commenced.

The orientals do not agree with us as to the time of the hegira. Among the Mahomedans, Amasi fixes it to the year of Christ 630. and from the death of Moses 2347; and Ben Cassem, to the year of the world 5800: according to the Greek computation, among the Christians, Said Ebn Batrik refers the hegira to the year of Christ 614, and of the creation 6114.

HEIDEGGER (John James), a native of Zurich in Switzerland, who came to England in 1708, being then about fifty. By his address and ingenuity he became the arbiter elegantiarum to the court, and manager of the opera-house, by which means he contrived to gain 5000l. a-year. He was a man of good humour and liberality. He died in 1749.

Being once at supper with a large company when a question was debated, Which nationalist of Europe had the greatest ingenuity? to the surprise of all present, he claimed that character for the Swiss, and appealed to himself for the truth of it. "I was born a Swiss (said he), and came to England without a farthing, where I have found means to gain 5000l. a-year, and to spend it. Now I defy the most able Englishman to go to Switzerland, and either to gain that income or to spend it there." Heidegger is said to have had so remarkable a memory, that he once walked from Charing-cross to Temple-bar, and back again; and when he came home, wrote down every sign on each side of the street. Heidegger was noted for a remarkably unpleasing countenance and harshness of features; this naturally led to many jokes, as he was a good natured man; many of them are retailed by the Joe Millers of the day.

HEIDELBERG, a considerable and populous town of Germany, capital of the Lower Palatinate, with a celebrated university. It is noted for its great tun, which holds 800 hogsheads, generally kept full of good Rhenish wine. It stands in a pleasant rich country, and was a famous seat of learning; but it has undergone so many calamities, that it is nothing now to what it was formerly. The town is commercial, and has manufactures of stuffs, silk-stockings, &c. It stands on the south side of the Neckar, over which is a handsome bridge. Lat. 49. 20 N. Lon. 8. 48 E.

HEIDENHEIM, a town of Suabia, with a palace belonging to the house of Wurtemburg. Lat. 48. 47 N. Lon. 10. 9 E.

HE'IFER. *s.* (heafore, Saxon.) A young cow (*Pope*).

HEIGH HO. *interj.* An expression of slight languor and uneasiness (*Shakspeare.*)

HEIGHT. *s.* (from *high.*) 1. Elevation above the ground (*Addison*). 2. Altitude; space measured upwards (*Dryden*). 3. Degree of latitude (*Abbot*). 4. Summit; ascent; towering eminence; high place (*Dryden*). 5. Elevation of rank; station of dignity (*Sh.*). 6. The utmost degree; full completion (*Bacon*). 7. Utmost exertion (*Shak.*). 8. State of excellence; advance toward perfection (*Add.*).

HEIGHT, in geometry, is a perpendicular let fall from the vertex, or top, of any right-lined figure, upon the base or side subtending [illegible]. It is likewise the perpendicular altitude of any object above the horizon; and is found several ways by [illegible] plain mirror, with the quadrant, theodolite, or some graduated instrument, &c. The measuring of heights or distances is of two kinds: when the place or object is accessible, as when we can approach to its bottom; or inaccessible, when it cannot be approached. See SURVEYING, and ALTITUDE.

To HEIGHTEN. *v. a.* (from *height.*) 1. To raise higher. 2. To improve; to meliorate. 3. To aggravate (*Addison*). 4. To improve by decorations (*Dryden*).

HEILA, a town of Western Prussia, at the mouth of the Vistula, on the Baltic Sea. Lat. 54. 53 N. Lon. 19. 25 E.

HEILIGELAND, an island in the German Ocean, between the mouths of the Eyder and the Elbe, belonging to Denmark. Lat. 54. 21 N. Lon. 8. 20 E.

HEILIGENSTADT, a town of Germany, capital of the territory of Etchset, belonging to the elector of Mentz. Lat. 51. 22 N. Lon. 10. 14 E.

HEINECCIUS (John Gotlieb), one of the greatest civilians of the 18th century, was born at Eisenberg, in the principality of Altenburg, in 1681. After having studied at Goslar and Leipsic, he was designed for the ministry, and began to preach; but disliking that profession, he laid it aside, and applied himself entirely to the study of philosophy and the civil law. In 1710 he became professor of philosophy at Hall; and in 1721 he was made professor of civil law, with the title of counsellor of the court. His great reputation made the States of Friesland invite him to Franeker in 1724; but three years after the king of Prussia prevailed on him to accept of a professorship of law at Francfort on the Oder, where he distinguished himself till the year 1733. Becoming again professor at Hall, he remained there till his death, which happened in 1741, notwithstanding his being invited to Marpurg, Denmark, and three academies in Holland. He wrote many works, all of them much esteemed. The principal are, 1. Antiquitatum Romanarum jurisprudentiam illustrantium syntagma. It was this excellent abridgement that gave rise to his reputation in foreign countries. 2. Elementa juris civilis secundum ordinem institutionum et pandectarum. 3. Fundamenta styli cultioris. There are few works so useful as this for forming a Latin style. 4. Elementa philosophiæ rationalis et moralis, quibus præmissa historia philosophica. 5. Historia juris civilis Romani ac Germanici. 6. Elementa juris naturæ et gentium, &c.

HE'INOUS. *a.* (*haineux*, French.) Atrocious; wicked in a high degree (*Tillotson*).

HE'INOUSLY. *ad.* Atrociously; wickedly.

HE'INOUSNESS. *s.* (from *heinous.*) Atrociousness; wickedness (*Rogers*).

HEINSIUS (Daniel), a famous critic, was born at Ghent in 1580. After going through his studies at various universities he was made Greek professor at Leyden, when he was but eighteen; and afterwards succeeded his master Joseph Scaliger in the professorship of politics and history. He died in 1621. He wrote numerous [illegible] in different languages; several admired works in prose, as Laus Asini, Laus Pediculi, &c.; and illustrated many of the Greek and Latin classics.

HEINSIUS (Nicholas), son of the preceding, was born at Leyden in 1620. He was an eminent Latin poet, and has been called the Swan of Holland. He also published editions of Virgil, Ovid, Claudian, and other Latin authors, with learned notes. He died in 1681.

HEIR, is he to whom lands, tenements, or hereditaments, by the act of God and right of blood, descend of some estate of inheritance. Co. Lit. 7. b.

HEIR APPARENT. Here we must observe, that no person can be heir until the death of his ancestor: yet in common parlance, he who stands nearest in degree of kindred to the ancestor is called even in his life-time heir apparent. Co. Lit. 8. n. The law also takes notice of an heir apparent, so far as to allow the father to bring an action of trespass for taking away his son and heir, the father being guardian by nature to his son, where any lands descended to him. Co. Lit. 37.

Heir-general: the heir-general, or heir at common law, is he who after his father's or ancestor's death has a right to, and is introduced into, all his land, tenements, and hereditaments; but he must be of the whole blood, not a bastard, alien, &c. None but the heir-general, according to the course of the common law, can be heir to a warrantry, or sue an appeal of the death of his ancestors. Co. Lit. 14.

Customary heir: a custom in particular places varying the rules of descent at common law is good; such is the custom of gavelkind, by which all the sons shall inherit, and make but one heir to their ancestor; but the general custom of gavelkind lands extends to sons only; but a special custom, that if one brother dies without issue, all his brothers may inherit, is good. Co. Lit. 140. a.

To prevent the wrong and injury to creditors by the alienation of the lands descended, &c. by 3 and 4 W. and M. c. 14. it is enacted that in all cases where any heir at law shall be liable to pay the debt of his ancestor in regard of any lands, tenements, or hereditaments descending to him, and shall sell, alien, and make over, the same before any action

brought or process sued out against him, such heir at law shall be answerable for such debt or debts in action or actions of debt to the value of the said land so by him sold, alienated, or made over: in which case all creditors shall be preferred, as in actions against executors and administrators: and such execution shall be taken out upon any judgment or judgments so obtained against such heirs, to the value of the said land, as if the same were his own proper debts; saving that the lands, tenements, and hereditaments, bona fide aliened before the action brought, shall not be liable to such execution. Provided, that where any action of debt upon any specialty is brought against any heir, he may plead riens per descent at the time of the original writ brought, or the bill filed against him; any thing therein contained to the contrary notwithstanding. And the plaintiff in such action may reply, that he had lands, tenements, or hereditaments, from his ancestor before the original writ brought, or the bill filed; and if upon issue joined thereupon, it is found for the plaintiff, the jury shall inquire of the value of the lands, tenements, or hereditaments so descended, and thereupon judgment shall be given, and execution shall be awarded as aforesaid; but if judgment is given against such heir, by confession of the action with the assets descended, or upon demurrer, or nihil dixit, it shall be for the debt and damages, without any writ to enquire of the lands, tenements, or hereditaments, so descended.

Before this statute, if the ancestor had devised away the lands, a creditor by specialty had no remedy, either against the heir or devisee. Abr. Eq. 149.

But by the said statute, it is enacted that all wills and testaments, of or concerning any manors, messuages, lands, tenements, or hereditaments, or of any rent, profit, term, or charge out of the same, whereof any person at the time of his decease shall be seized in fee simple, possession, reversion, or remainder, or have power to dispose of the same by his last will and testament, shall be deemed and taken only against such creditor as aforesaid, his heirs, successors, executors, administrators and assigns, and every of them, to be fraudulent, and clearly, absolutely, and utterly void, frustrate, and of none effect; any pretence, colour, feigned or presumed consideration, or any other matter or thing, to the contrary notwithstanding.

And for the means, that such creditors may be enabled to recover their said debts, it is farther enacted, that in the cases before-mentioned, every such creditor shall and may maintain his action of debt, upon his said bonds and specialties, against the heir at law of such obligor, and such devisee and devisees jointly, by virtue of this act; and such devisee and devisees shall be liable and chargeable for a false plea by him or them pleaded in the same manner as any heir should have been for false plea by him pleaded, or for not confessing the lands or tenements to him descended.

Provided, that where there has been or shall be any limitation or appointment, devise or disposition, of any manors, messuages, lands, tenements, or hereditaments, for the raising or payment of any real or just debt, or any portion, sum, or sums of money, for any child or children of any person, other than the heir at law, in pursuance of any marriage-contract or agreement in writing bona fide made before such marriage; the same and every of them shall be in full force, and the same manors, &c. may be holden and enjoyed by every such person, his heirs, executors, administrators, and assigns, for whom the said limitation, appointment, devise, or disposition was made, and by his trustee, his heirs, executors, administrators, and assigns, for such estate or interest as shall be so limited or appointed, devised, or disposed, until such debt or debts, portion or portions, shall be raised, paid, and satisfied; any thing contained in this act to the contrary notwithstanding.

And it is further enacted by the said statute, that all and every devisee and devisees made liable by this act, shall be liable and chargeable in the same manner as the heir at law, by force of this act, notwithstanding the lands, tenements, and hereditaments to him or them devised, shall be aliened before the action brought.

In the construction of this statute it has been holden, that though a man is prevented thereby from defeating his creditors by will, yet any settlement or disposition he shall make in his life-time of his lands, whether voluntary or not, will be good against bond creditors; for that was not provided against by the statute, which only took care to secure such creditors from any imposition which might be supposed in a man's last sickness; but if he gave away his estate in his life-time, this prevented the descent of so much to the heir, and consequently took away their remedy against him, who was only liable in respect of the lands descended; and as a bond is no lien whatsoever on the lands in the hands of the obligor, much less can it be so when they are given away to a stranger. Abr. Eq. 149.

To HEIR. *v. a.* To inherit (*Dryden*).

HE'IRESS. *s.* (from *heir.*) An inheritrix; a woman that inherits (*Waller*).

HE'IRLESS. *a.* (from *heir.*) Without an heir; wanting one to inherit after him (*Sh.*).

HE'IRLOOM. *s.* (*heir* and ȝeloma, goods, Saxon.) Any furniture or moveable decreed to descend by inheritance, and therefore inseparable from the freehold (*Swift*).

HE'IRSHIP. *s.* (from *heir.*) The state, character, or privileges of an heir (*Ayliffe*).

HEISTERIA. In botany, a genus of the class decandria, order monogynia. Calyx five-cleft; petals five; drupe with a very large coloured calyx. One species only; a tree of Martinico with oblong leaves, and small axillary flowers.

HELCONIA. (*helconia*, from ἑλκος, an ulcer). An ulcer in the external or internal superficies of the cornea, known by an exca-

vation and ouzing of purulent matter from the cornea.

HELD. The preterit and part. pass. of *hold*.

HELENA, Helen, the most celebrated beauty of her age, sprang from one of the eggs which Leda, the wife of Tyndaris, brought forth after her amour with Jupiter, metamorphosed into a swan. Her beauty was so admired even in infancy, that Theseus, with his friend Pirithous, carried her away before she had attained her tenth year, and concealed her at Aphidnæ; but her brothers, Castor and Pollux, recovered her, and she returned unpolluted to Sparta. This violence offered to her virtue rather augmented her fame, and her hand was eagerly solicited by many of the young princes of Greece. At length all the suitors agreed by oath to abide by the uninfluenced choice which Helen herself should make, and also to unite, in order to defend her if any attempt was made to force her from her husband. Helen then fixed upon Menelaus, and married him. Hermione was the early fruit of this union. After this, Paris, son of Priam, came to Lacedæmon on pretence of sacrificing to Apollo. He was kindly received by Menelaus, but shamefully, in his absence in Crete, corrupted the fidelity of his wife Helen, and persuaded her to follow him to Troy, B. C. 1198. At his return, Menelaus, highly sensible of the injury, assembled the Grecian princes, and reminded them of their solemn promises. They resolved to make war against the Trojans; but previously sent ambassadors to Priam to demand the restitution of Helen, but received no satisfactory answer. Soon after their return, their combined forces assembled, and sailed for the coast of Asia. Authors have differed much with respect to her conduct while at Troy. After the death of Paris she married Deiphobus, whom she betrayed, in order to ingratiate herself with Menelaus. She returned to Sparta with Menelaus, who pardoned all her errors. Some assert that she had willingly followed Paris, and that she warmly supported the cause of the Trojans; while others believe that she secretly favoured the cause of the Greeks, always sighed after her husband, and cursed the day in which she had proved faithless to his bed. Homer represents her as in the last instance. After she had lived for some years at Sparta, Menelaus died, and she was driven from Peloponnesus by Megapenthes and Nicostratus, the illegitimate sons of her husband. She retired to Rhodes, where Polyxo, a native of Argos, who reigned over the country, caused her to be tied to a tree and strangled. Herodotus mentions a tradition, that Paris, on his return from Sparta, was driven on the coast of Egypt where Helen was detained by Proteus, king of the country, in consequence of his ingratitude to Menelaus. Helen was honoured after death as a goddess, and the Spartans built her a temple at Therapne, which had power of giving beauty to all the deformed women that entered it.—2. A young woman of Sparta, often confounded with the daughter of Leda. As she was going to be sacrificed, because the lot had fallen upon her, an eagle came and carried away the knife of the priest, upon which she was released, and the barbarous custom of offering human victims was abolished.

Helena (St.), an island in the Atlantic Ocean, first discovered by the Portuguese. From them it passed to the Dutch; and in the year 1600 the English became its masters. After they had once obtained possession, they maintained it without disturbance till the year 1673, when the Dutch took it by surprise, but did not long enjoy the fruits of their conquest, for it was retaken a short time afterwards, by the brave captain Munden, with three Dutch East Indiamen in the harbour. The island of St. Helena is about twenty miles in circumference, and the land so high, that it may be discerned at sea above twenty leagues' distance. It consists indeed of one vast rock, perpendicular on every side, like a castle in the middle of the ocean, whose natural walls are too high to be attempted by scaling-ladders; nor is there the smallest breach, except at the bay called Chapel Valley Bay, which is fortified with a strong battery of fifty large cannon, planted even with the water, and farther defended by the perpetual dashing of prodigious waves against the shore, which, without farther resistance, makes the landing difficult; and a little creek, where two or three men may land from a small boat, but now rendered inaccessible by a battery. As there is no other anchorage but at Chapel Valley, touching here is extremely precarious; for the wind always setting from the south-east, if a ship once over-shoots it, it is a matter of great difficulty again to recover the harbour. Notwithstanding St. Helena appears on every side to be a hard barren rock, yet on the top it is covered with a coat of fine rich mould, about a foot and a half deep, which produces all manner of grain, grass, fruits, herbs, roots, and every kind of vegetables, in the utmost perfection and plenty. After ascending the rock which borders it to the sea, the country is prettily diversified with rising hills and vallies; the first covered naturally with a great variety of herbs, and the latter adorned with elegant plantations of fruit-trees and gardens, among which are dispersed the houses of the natives; while herds of cattle low about the fields, some of which are fattened for the supply of shipping and of the islanders, and the rest kept for milk, butter, and cheese, and to afford a prospect equally rich and delightful. Upon this island there are nearly 300 English families, or, at least, descended from English parents. Some French refugees were likewise encouraged to settle, in order to propagate vines, and make wine, a point in which they have been by no means successful. Every family has its house and plantation, on the higher part of the island, where they look after their cattle, hogs, goats, and poultry, fruit and kitchen gardens, without scarcely ever descending to the town in Chapel Valley, unless it be once a week to church, or when the shipping arrives; at which times almost every house in the valley

is converted to a punch-house, or lodgings for their guests, to whom they sell their hogs, poultry, and fruits, receiving in exchange flour, wine, and whatever necessaries they want, but they must first come into the company's warehouse. The merchandize usually laid in by the company are Cape wines, brandy, European or Canary wines, Batavia arrack, beer, malt, sugar, tea, coffee, china-ware, Japan cabinets, calicoes, chintzes, muslins, ribands, woollen cloths and stuffs, with a variety of other particulars. The governor resides in a fort with a garrison, and centinels are always placed on the highest part of the island, to give notice of the approach of any vessels. This island is situated about 400 leagues from the coast of Africa, and 600 from the coast of South America. Lon. 5. 49 W. Lat. 15. 55 S.

HELENA (St.), an island in the Atlantic, in a bay called St. Helena Sound, about thirty miles in circumference. Lon. 80. 36 W. Lat. 32. 25 N.

HELENIUM. Bastard sun-flower. In botany, a genus of the class syngenesia, order polygamia superflua. Receptacle naked, except the calycine chaff of the margin; down five-awned; calyx one leafed, many-parted; florets of the margin half three-cleft. Three species natives of America. The species most common in our own gardens is H. autumnale, with serrate and quite glabrous leaves. It rises to the height of six or seven feet, in good ground, and may be propagated either by seeds or by parting of the roots, which last method is generally practised in this country, because the plant seldom perfects its seeds here. The seeds should be sown in March, on a bed of light earth, where they often remain a whole year before the plants appear. When they come up, if the season prove dry, they should be often watered, thinned where they grow too close, and transplanted into beds a foot asunder, every May; then let them be shaded till they have taken root, and watered in dry weather. In autumn they may be transplanted to the places where they are to remain. The old roots should be transplanted and parted in October, when their flowers are over, or in the beginning of March, just before they begin to shoot. They should be carefully watered, if the season require it; and not be removed oftener than every other year.

HELENS (St.), a town of the Isle of Wight, in East-Medina, has a bay which runs a considerable way within land, and in a war with France is often the station and place of rendezvous for the royal navy. At the mouth of the bay is that cluster of rocks called the Mixen. It had an old church situated at the extremity of the coast, which was in danger of being washed away, as was great part of the church-yard, which occasioned a new church to be built in 1719.

HELENUS, in fabulous history, son of Priam and Hecuba, was a famous prophet, and greatly respected by all the Trojans. It was he who disclosed that Troy could not be taken whilst in the possession of the palladium, nor until Philoctetes came from his retreat at Lemnos, and assisted at the siege. After the ruin of his country, he fell to the share of Pyrrhus, the son of Achilles, and received from his hand Andromache, the widow of his brother Hector; some say he married her after the death of Pyrrhus. Helenus was the only one of Priam's sons who survived the ruin of his country. After the death of Pyrrhus, he reigned over part of Epirus, which he called Chaonia, in memory of his brother Chaon, whom he had inadvertently killed.

HELEPOLIS, in antiquity, a military machine, for battering down walls.

The helepolis, as described by Diodorus Siculus, &c. appears to have been no more than the aries or battering-ram, with a roof or covering over it, to prevent its being set on fire, as also to screen the men who worked it.

HELIACAL, in astronomy, a term applied to the rising and setting of the stars; or, more strictly speaking, to their emersion out of and immersion into the rays and superior splendor of the sun. A star is said to rise heliacally, when, after having been in conjunction with the sun, and on that account invisible, it comes to be at such a distance from him as to be seen in the morning before sun-rising; the sun, by his apparent motion, receding from the star towards the east. On the contrary, the heliacal setting is when the sun approaches so near a star as to hide it with his beams, which prevent the fainter light of the star from being perceived; so that the terms apparition and occultation would be more proper than rising and setting.

HELIÆA, in Grecian antiquity, was the greatest and most frequented court in Athens for the trial of civil affairs. See HELIASTÆ.

HELIANTHUS. Sun-flower. In botany, a genus of the class syngenesia, order polygamia frustranea. Receptacle chaffy, flat; seeds crowned with two lanceolate chaffy leaves; calyx imbricate, spreading at the top. Twenty-one species; a few natives of the East Indies, but the greater part indigenous to North or South America. Some of them perennial, (see Nat. Hist. Pl. CXXVII), some triennial, and some annual plants. Most of them are propagated in our own gardens, and especially the large annual sun-flower and the Jerusalem artichoke, which is one of the species of this genus. The Jerusalem artichoke is perennial, and a native of Brazil: it is propagated in many gardens for the sake of the roots, which are by some people very much esteemed: these, as well as all the other species, are hardy plants, and are propagated by parting their roots, which spread and increase greatly. The best season for this is about the middle of October, soon after the flowers are past, or very early in the spring; after which the plants will require no other trouble than to be kept clear from weeds.

The following are worthy of notice.

1. H. alhagi: with simple, lanceolate-obtuse leaves; shrubby spinous stem. A native of

Persia, from which manna is obtained by the inhabitants.

2. H. gyrans. Moving plant. Leaves ternate, ovate-lanceolate, obtuse; the lateral ones very minute; panicle terminal; loments repand below, roughish, pendulous. A Bengal plant, and gathered on the banks of the Ganges. This extraordinary plant has a constant and voluntary motion, consisting in an alternate meeting and receding of the leaflets, a motion which seems totally unconnected with any external stimulus; certainly not dependent on the light of the sun, for they move in the dark as well as in the light, and even when the leaves are perfectly asleep. It is also remarkable that the leaves, in the height of erection and during very warm but serene days, discover a tremulous motion. The common motion will continue for twenty-four hours in a branch lopped off from the parent stem if put into water. This plant in Bengal is called burrum kundali; it is four feet high, and produces yellow flowers in the autumn. The root is annual or biennial.

3. H. coronarium. French honey-suckle. Caulescent; diffuse; leaves pinnate, roundish-elliptic; joints of the loment roundish, prickly, naked. It rises three or four feet high; and throws forth between the leaves long spikes of beautiful red flowers, succeeded by loments or seed-pods of a peculiar kind. It is a native of Italy.

4. H. onobrychis. Saintfoin. Stem ascending; leaves pinnate, elliptic, nearly glabrous; wings of the corol as long as the calyx: loments one-seeded, reticulate, with prickly teeth on one side. Indigenous to our own country, and largely cultivated by agriculturists. See HUSBANDRY.

HELIASTÆ, in antiquity, the judges of the court Heliæa. They were so called, according to some authors, from a Greek word which signifies to assemble in a great number; and, according to others, from another word which signifies the sun, because they held their assemblies in an open place. It was a maxim among the Athenians that no cause could be judged by any tribunal before it had been submitted to arbitration. When the matter could not be reconciled by this procedure it was brought before the 6000 judges. These were not all employed in judging at the same time, but from them the Heliastæ were drawn by lot; and their number depended on the nature of the subject to be decided. In ordinary cases they amounted to 500, and formed consequently an unequal tribunal, proceeding in civil causes on the plan which the Areopagites had adopted with respect to crimes. When discussions of greater consequence were brought forward, they sometimes occupied 1000, or even 1500 judges, as was the case when Demosthenes was accused of being corrupted by the money of Harpalus. That number was never surpassed except in cases of high treason, or *lese-majesty*. De Pauw.

We are told by Diogenes Laertius, in his Life of Solon, that it was before one of these Heliastic assemblies that Pisistratus presented himself, covered with wounds and contusions (for thus he had treated himself and the mules which drew his car), to excite the indignation of the people against his pretended enemies, who jealous, as he alleged, of the popularity he had acquired by asserting the rights of his poorer fellow-citizens, in opposition to the men in power, had attacked him while he was hunting, and had wounded him in that barbarous manner. His design succeeded: a guard was appointed him; by the assistance of which he acquired the sovereignty or tyranny of Athens, and kept it 33 years. The power of the assembly appeared remarkably on that occasion; for Solon, who was present, opposed it with all his efforts, and did not succeed.

As to the manner in which the judges gave their suffrages, there was a sort of vessel covered with an osier mat, in which were placed two urns, the one of copper, the other of wood. In the lid of these urns there was an oblong hole, which was large at the top, and grew narrower downwards, as we see in some old boxes of our churches. The suffrages which condemned the accused person were thrown into the wooden urn, which was termed kyrios. That of copper, named akyros, received those which absolved him.

HE'LICAL. *a.* (*helice*, Fr. from ἑλιξ.) Spiral; with many circumvolutions (*Wilkins*).

HELICE, in astronomy, the same with ursa major.

HE'LICIS MAJOR. (*helix.*) A proper muscle of the ear, which depresses the part of the cartilage of the ear into which it is inserted: it lies upon the upper or sharp point of the helix or outward ring, arising from the upper and acute part of the helix anteriorly, and passing to be inserted into its cartilage a little above the tragus.

HE'LICIS MINOR. A proper muscle of the ear, which contracts the fissure of the ear: it is situated below the helicis major, upon part of the helix. It arises from the inferior and anterior part of the helix, and is inserted into the crus of the helix, near the fissure in the cartilage opposite to the concha.

HELICOID PARABOLA, or the PARABOLIC SPIRAL, is a curve arising from the supposition that the common or Apollonian parabola is bent or twisted, till the axis come into the periphery of a circle, the ordinates still retaining their places and perpendicular positions with respect to the circle, all these lines still remaining in the same plane. The equation of this curve remains the same, as when it was a parabola.

HELICON, in ancient geography, the name of a mountain in the neighbourhood of Parnassus and Cytheron, sacred to Apollo and the muses, who are thence called Heliconides. It is situated in Livadia, and now called Zagara or Zaguya. Helicon was one of the most fertile and woody mountains in Greece. Here was the shady grove of the muses, and their images, with statues of Apollo and Bacchus, of Linus and Orpheus, and the illustrious

poets who had recited their verses to the harp.

Helicon, the name given to a curious instrument suggested by Ptolemy, for demonstrating the consonances.

HELICONIA. In botany, a genus of the class pentandria, order monogynia. Spathe general and partial; calyxless; corol three-petalled; nectary two-leaved; capsule three-celled; the cells one-seeded. Five species; herbaceous stove-plants of the West Indies or South America, with beautiful red or saffron corols.

HELI'CTERIS. Screw-tree. In botany, a genus of the class monadelphia, order dodecandria. Calyx tubular, obliquely five-cleft; petals five; germ on a very long pedicel; style about five-cleft; capsules five, one-celled, many-seeded, spirally twisted. Eight species,—trees or shrubs; and indigenous to India, South America, or the West Indies; commonly with yellow red, or purple flowers; in one species, a native of Carthagena, of a fetid odour. They are cultivated in our own gardens, but require care and a green-house or stove during winter.

HELIER, (St.) the capital of the island of Jersey, in the English Channel, seated in the bay of St. Aubin, where it has a harbour, and a stone pier, having the sea on the S. W. and hills on the N. that shelter it from the cold. Another large hill projects in a manner over the town, and has a pleasant walk, that affords an extensive prospect. The streets are wide and well-paved. The inhabitants are computed to be 2000. In the church, prayers are read alternately in English and French. Lat. 49. 11 N. Lon. 2. 10 W.

Helier, (St.) a little island, near the town of the same name, in the bay of St. Aubin, on the S. side of Jersey. It took its name from Elerius, or Helier, a holy man, who lived in this island many centuries ago, and was slain by the Pagan Normans at their coming here. He is mentioned among the martyrs in the Martyrology of Coutances. His little cell, with the stone bed, is still shown among the rocks; and in memory of him a noble abbey was founded in this island.

HELIOCA'RPUS. In botany, a genus of the class dodecandria, order digynia. Calyx four-leaved; petals four; styles simple; capsule two-celled, compressed, longitudinally surrounded with filiform feathered rays on each side. One species, a tree of Vera Cruz, with heart-shaped serrate alternate leaves.

HELIOCENTRIC PLACE OF A PLANET, is the place of the ecliptic, in which the planet would appear to a spectator placed at the centre of the sun: it agrees with the *heliocentric longitude. Heliocentric latitude* of a planet, is the inclination of the line drawn from the centre of the sun to that of the planet, to the plane of the ecliptic.

HELIOCOMETE, a phænomenon sometimes observed about sun-setting; being a large luminous tail or column of light proceeding from the body of the sun, and dragging after it, not unlike the tail of a comet; whence the name.

A phænomenon of this kind was observed at Gripswald, March 15th, 1702, about 5 o'clock P. M. The extremity of the tail nearest the sun was in breadth about half the diameter of that luminary, but the other extremity seemed in breadth more than five solar diameters: and the whole tail followed the direction of the sun. Its colour was yellow near the sun, and gradually darkened at the remoter parts; so that it was only seen as if painted on the rarer and more elevated clouds. This heliocomete appeared for an hour, and then gradually diminished, the sun being at the horizon. The phænomenon in some respects resembles the zodiacal light.

HELIODORUS, a Christian bishop of Trica in the fourth century. He was in all probability one of the earliest writers of novels; and professor Robison observes that in his piece, which was called "The Adventures of Theagenes and Chariclea," woman is first pictured as a respectable character. I think (says he) the heroine is a greater character than you will meet with in all the annals of antiquity. And it is worth while to observe what was the effect of this painting. The poor bishop had been deposed, and even excommunicated, for doctrinal errors, and for drawing such a picture of a heathen. The magistrates of Antioch, the most voluptuous and corrupted city of the East, wrote to the emperor, telling him that this book had reformed the ladies of their city, where Julian the emperor and his sophists had formerly preached in vain, and they therefore prayed that the good bishop might not be deprived of his mitre." This romance has been frequently printed in Greek and Latin. Heliodorus was also a good Latin poet.

HELIOGABALUS, a deity among the Phœnicians. M. Aurelius Antoninus, a Roman emperor, son of Varius Marcellus, was also called Heliogabalus, because he had been priest of that divinity, in Phœnicia. After the death of Macrinus, he was invested with the purple, and the senate approved of his election, and bestowed upon him the title of Augustus at the age of 14 years. Heliogabalus made his grand-mother and mother his colleagues on the throne, and chose a senate of women, over which his mother presided, and prescribed all the fashions which prevailed in the empire. Rome now displayed a scene of cruelty and debauchery, and the imperial palace was full of prostitution. He raised his horse to the honours of the consulship. To the ridiculous deity Heliogabalus, which was only a black stone, temples were raised at Rome, and the altars of the gods plundered to deck those of the new divinity. He married four wives; and not satisfied with following the plain laws of nature, he professed himself to be a woman, and gave himself up to one of his officers, called Hierocles. In this ridiculous farce he suffered the greatest indignities from his pretended husband. Such licentiousness soon became detestable to the Romans. At length,

through terror of the soldiers, he hid himself in the filth and excrements of the camp, where he was found in the arms of his mother. His head was severed from his body the 10th of March, A. D. 222, in the 18th year of his age. He was succeeded by Alexander Severus. His cruelties were as conspicuous as his licentiousness. He often tied some of his favourites on a large wheel, and was particularly delighted to see them whirled round like Ixions, and sometimes suspended in the air, or sunk beneath the water.

HELIOMETER, or ASTROMETER, an instrument for measuring, with particular exactness, the diameters of the sun, moon, and stars. It was invented by M. Bouguer in 1747, and is a kind of telescope, consisting of two object glasses of equal focal distance, placed by the side of each other, so that the same eye-glass serves for both. The tube is of a conical form, larger at the upper end, which receives the two object-glasses, than at the lower, which is furnished with an eye-glass and micrometer. By the construction of this instrument two distinct images of an object are formed in the focus of the eye-glass, whose distance, depending on that of the two object-glasses from one another, may be measured with great accuracy. Mem. Acad. Sci. 1748.

Mr. Servington Savery discovered a similar method of improving the micrometer, which was communicated to the Royal Society in 1743.

HELIOPHILA. In botany, a genus of the class tetradynamia, order siliquosa. Nectaries two, recurved towards the vesicular base of the calyx. Thirteen species, all herbaceous plants of the Cape.

HELIOPOLIS, a famous city of Lower Egypt, in which was a temple sacred to the sun. The inhabitants worshipped a bull called Mnevis, with the same ceremonies as the Apis of Memphis. Apollo had an oracle there.

HELIOSCOPE, a kind of telescope peculiarly adapted for viewing and observing the sun without hurting the eye. There are various kinds of this instrument, usually made by employing coloured glass for the object or eye-glass, or both; and sometimes only using an eye-glass blacked by holding it over the smoke or flame of a lamp or candle, which is Huygens's way. See Dr. Hooke's treatise on Helioscopes.

HELIOSTATA, an instrument invented by Dr. Gravesande, and so called from its property of fixing the sun-beam in one position, viz. in a horizontal direction across the dark chamber while it is used. See Gravesande's Physices Element. Mathematica, tom. 2, p. 715. ed. 3tia 1742.

HELIOTROPE, HELIOTROPIUM, among the ancients, an instrument or machine for showing when the sun arrived at the tropics and the equinoctial line. This name was also used for a sun-dial in general.

HELIOTROPE, in botany. See HELIOTROPIUM.

HELIOTROPII SUCCUS. See BEZETTA CERULEA.

HELIOTROPIUM. Heliotrope. Turnsole. In botany, a genus of the class pentandria, order monogynia. Corol salver-shaped, five-cleft, with teeth between the divisions; throat naked. Twenty-two species, scattered over the warm climates of all the quarters of the globe. Europe however affords but one species, thence named H. europæum, and a native of Spain and Italy, with white flowers, produced at the end of the branches. The berries of this plant are employed in the manufacture of colours. Many of the other species are propagated, and without much difficulty, in our gardens and green-houses.

HELISPHERICAL LINE, the rhumb-line.

HE'LIX. s. (*helice*, Fr. ἕλιξ.) Part of a spiral line; a circumvolution (*Wilkins*).

HE'LIX. (*helix*, ἕλιξ, from ἑλισσω, to turn about.) In anatomy, the external circle or border of the outer ear, that curls inwards.

HELIX, is by some architects distinguished from a spiral. Thus a staircase is said to be helical when the steps wind round a cylindrical newel; when they wind round a conical newel, the staircase is called spiral.

HELIX. Snail. In zoology, a genus of the class vermes, order testacea. Animal a limax; shell univalve, spiral, sublucid, brittle; aperture contracted; semilunar or roundish. Two hundred and sixty-seven species, scattered over the globe, of which about forty are common to our own country. They may be subdivided as follows:

A. whorls with a carinate acute margin.

B. umbilicate, the whorls rounded.

C. rounded, imperforate.

D. tapering.

E. ovate, imperforate.

The following are chiefly worthy of notice.

1. H. pomatia. Shell sub-umbilicate, subovate, obtuse, with a roundish semilunar aperture; reddish brown, with obsolete paleish bands. There are four or five varieties. It inhabits the woods of Europe, and was first introduced into England by sir Kelnelm Digby, for medical purposes. In many parts of Europe it is used as an article of food during Lent, and was a favourite dish among the Romans: it is oviparous; very tenacious of life, and towards winter covers its aperture with a calcareous lid. Under the Romans these were fed as an article of future luxury with bran and sodden wine: and it is stated by some writers that under this diet they grew occasionally to such an enormous size that their shells would contain ten quarts.

2. H. nitens. Shell umbilicate, subdepressed, fulvous, horny or yellowish-green, pellucid, substriate; aperture large: whorls four or five. This is one of the more common of the smaller and land specimens. It inhabits the wet woods of Europe; and is often not more than a line wide.

3. H. hortensis. Garden snail. Shell imperforate, globular, pale, with broad interrupted brown bands: lip white: from seven and a half to eight lines wide. Inhabits Europe, in gardens and orchards, and is extremely destruc-

tive to fruits and tender leaves. Among the many peculiarities of these animals, the mode by which they conduct their amours is most curious and surprising: at this season they make reciprocal approaches by discharging several small darts at each other, which are of a sharp form and of a horny substance. These are contained within a cavity on the neck, and are launched with some degree of force at bout the distance of two inches, till the quiver or reservoir is exhausted, when a reconciliation takes place, and the animals unite. The eggs are perfectly round, and about the size of small peas.

The eyes of all of them are placed at the extremity of the horns or tentacles: these are four, being the number of the tentacles. The spiracle or breathing aperture is situated near the neck.

4 H. janthina. Shell nearly imperforate, roundish, obtuse, diaphonous, and very brittle; aperture dilated, with an emarginate lip. A marine snail: it inhabits most seas; about an inch broad and high. Shell violet with a subtriangular aperture; the snail when alive emits phosphorescent light and shines in the dark: it stains the hand with a violet or purple dye. So small an animal as the snail is not free from the plague of supporting other smaller animals on its body; and, as in other animals, we find these secondary ones either living on their surface, as lice, &c. or only in the intestines, as worms; it is very remarkable, that the snail is infested in both these manners, lice being found sometimes on the surface of its body, and worms sometimes within its intestines. There is a part of the common garden snail, and of other of the like kinds, commonly called the collar; this surrounds the neck of the snail, and is considerably thick, and is the only part that is visible when the animal is retired quietly into its shell: in this state of the animal, these insects which infest it are usually seen in considerable numbers, marching about very nimbly on this part; besides, the snail, every time it has occasion to open its anus, gives them a place by which to enter into its intestines, and they often seize the opportunity.

HELL. *s.* (helle, Saxon.) 1. The place of the devil and wicked souls (*Shakspeare*). 2. The place of separate souls, whether good or bad (*Apostles Creed*). 3. Temporal death (*Psalms*). 4. The place at a running play to which those who are caught are carried (*Sid.*). 5. The place into which the tailor throws his shreds (*Hudibras*). 6. The infernal powers (*Cowley*).

HELL, GEHENNA, TARTARA, INFERNUS, &c. the place of divine punishment after death, in contradistinction to heaven. See HEAVEN.

As all religions have supposed a future state of existence after this life, so all have their hell or place of torment, in which the wicked are supposed to be punished. The hell of the ancient heathens was divided into two mansions, the one called Elysium, on the right hand, pleasant and delightful, appointed for the souls of good men, the other called Tartara, on the left, a region of misery and torment, appointed for the wicked. The latter was only hell in the present restrained sense of the word. See ELYSIUM.

The Jews placed hell in the centre of the earth, and believed it to be situated under waters and mountains. According to them there are three passages leading to it: the first is in the wilderness, and by that Korah, Dathan, and Abiram, descended into hell; the second is in the sea, because Jonah, who was thrown into the sea, cried to God out of the belly of hell; the third is in Jerusalem, because it is said, "The fire of the Lord is in Zion, and his furnace is in Jerusalem." They likewise acknowledged seven degrees of pain in hell, because they find this place called by seven different names in scripture. Though they believed that infidels, and persons eminently wicked, will continue for ever in hell, yet they maintained, that every Jew who is not infected with some heresy, and has not acted contrary to the points mentioned by the rabbins, will not be punished therein for any other crimes above a year at most.

Among Christians, there are two controverted questions in regard to hell; the one concerns locality, the other the duration of its torments. 1. The locality of hell, and the reality of its fire, began first to be controverted by Origen. That father, interpreting the scripture account metaphorically, makes hell to consist, not in external punishments, but in a consciousness or sense of guilt, and a remembrance of past pleasures. Among the moderns, Mr. Whiston advanced a new hypothesis. According to him, the comets are so many hells appointed in their orbits alternately to carry the damned into the confines of the sun, there to be scorched by its violent heat, and then to return with them beyond the orb of Saturn, there to starve them in these cold and dismal regions. Another modern author, not satisfied with any hypothesis hitherto advanced, assigns the sun to be the local hell. 2. As to the second question, viz. the duration of hell torments, we have Origen again at the head of those who deny that they are eternal; it being that father's opinion, that not only men, but devils, after a due course of punishment suitable to their respective crimes, shall be pardoned and restored to heaven. The chief principle upon which Origen built his opinion, was the nature of punishment, which he took to be emendatory, applied only as physic for the recovery of the patient's health. The chief objection to the eternity of hell torments among modern writers, is the disproportion between temporary crimes and eternal punishments. Those who maintain the affirmative, ground their opinion on the scripture accounts, which represent the pains of hell under the figure of a worm which never dies, and a fire which is not quenched; and also upon the words, "These shall go away into everlasting punishment, but the righteous into life eternal." We are told, indeed, by the editors of a late "Improved Version of the New Testament, upon the Basis of Abp. Newcome's," that

"the word here rendered punishment, properly signifies correction inflicted for the benefit of the offender." But in opposition to this, we beg leave to say, that κολασις does not properly signify correction inflicted for the benefit of the offender. Its proper and original signification we affirm to be punishment in general, on the authority, first of Hesychius, who explains it by τιμωρια, and, secondly, of Scapula, who translates it *punitio, item castigatio*. The word occurs but in one other place in the New Testament. Allowing, however, the interpretation given in the new version, it would be impossible to find the person of whom it could be said, as our Lord said of Judas, "It were better for that man never to have been born." The awful picture of the duration of future punishment, given in Mark ix. 43. 49. must, we think with most persons who receive the scriptures as the word of God, be decisive on this point. The expression "where their worm dieth not, and the fire is not quenched" is reiterated with solemn and dreadful force: and the declaration "every one shall be salted with fire," implies, in our estimation, if it imply any thing, that, as salt preserves from putrefaction flesh to which it is applied, so those unhappy victims of divine justice shall be salted with fire, and, instead of being consumed by it, shall, in the wretched abodes to which they are consigned, continue immortal in the midst of their flames! Notwithstanding all this, however, the annotators just referred to proceed without dismay, saying "The word translated *everlasting*, is often used to express a long but indefinite duration. Rom. xvi. 25; 2 Tim. i. 9; Philemon, ver. 15. This text, therefore, so far from giving countenance to the harsh doctrine of eternal misery, is rather favourable to the more pleasing and more probable hypothesis, of the ultimate restitution of the wicked to virtue and to happiness." More pleasing and more probable indeed, to the wicked, who never properly estimate the "exceeding sinfulness of sin" and its extreme enormity in the view of an infinitely pure and holy being: and this is not among the least effectual of the means by which they are seduced to that place of torment. The word αιωνιος occurs seventy-one times in the New Testament. There are five instances in which a proper eternity may not be understood. Rom. xvi. 25; 2 Tim. i. 9; Tit. i. 2; Philem. ver. 15; and Jude ver. 7. The first three are resolvable into one, and express the counsels of mercy towards man before the creation. But the word in this and the other two passages, seems to express a perpetuity limited only by the temporary nature of the subject. In such instances the metaphorical use of a term may surely be allowed, without derogating from the proper use in other places. In most of the remaining 66 instances the word is applied to life, and has been generally allowed to signify a proper eternity. Why it should not, when applied to future punishment, and particularly in Matt. xxv. 46, where the same word is used to describe the opposite final doom of the righteous and the wicked, in the very form of antithesis, and in the short space of a moderate verse, is a momentous question to those who adopt the negative. In Rev. xx. 10, the expression εις τους αιωνας των αιωνων, is so strong, that if it do not express a proper eternity, it will be difficult to produce any scripture that does. But that the word αιωνιος does signify a proper eternity with reference to the future state of mankind, generally considered, in one passage of the New Testament, viz. 2. Cor. iv. ult., we think few will presume to deny. There the things which are seen, every thing visible or material, the world and all the things of it, are put in express opposition to the unseen future state; and the things that are seen are said to be for a short time (or temporary), but the things which are not seen are everlasting. It is not, however, on a single term that we are constrained to rest so important a doctrine. Every one who has the most superficial acquaintance with scripture can recollect a variety of very solemn declarations expressive of the eternity as well as of the extreme torment of the punishment appointed to the wicked; and the most rigid critical analysis cannot, we believe, extract an atom of hope, that those who go away into "*aionian* punishment," (as Mr. Scarlett translates the phrase) will ever be restored to virtue and to happiness.

HELL-BLACK. *a.* Black as hell (*Shakspeare*).

HELL-BROTH. *s.* A composition boiled up for infernal purposes (*Shakspeare*).

HELL-DOOMED. *a.* Consigned to hell (*Milton*).

HELL-HATED. *a.* Abhorred like hell (*Shakspeare*).

HELL-HOUND. *s.* 1. A dog of hell (*Dry.*). 2. Agent of hell (*Milton*).

HELL-KITE. *s.* Kite of infernal breed (*Shakspeare*).

HELLAS, in ancient geography, an appellation comprising, according to the more ancient Greeks and Romans, Achaia and Peloponnesus, but afterwards restrained to Achaia. It was called Hellas, from Hellen, the son of Deucalion.

HELLE, in fabulous history, a daughter of Athamas king of Thebes by Nephele. She fled from her father's house with her brother Phryxus, to avoid the cruel oppression of her mother-in-law Ino. According to some accounts she was carried through the air on a golden ram which her mother had received from Neptune, and in her passage she became giddy, and fell from her seat into that part of the sea which from her received the name of Hellespont. Others say that she was carried on a cloud, or rather upon a ship, from which she fell into the sea and was drowned. Phryxus, after he had given his sister a burial on the neighbouring coasts, pursued his journey and arrived in Colchis.

HELLEBORASTER. (*helleborastrum*, from ἑλλεβορος, hellebore.) Fetid hellebore, or bear's foot. Helleborus fœtidus, of Linnéus;

helleborus caule multifloro folioso; foliis pedatis. The leaves of this indigenous plant are recommended by many as possessing extraordinary anthelmintic powers. The smell of the recent plant is extremely fetid, and the taste is bitter and remarkably acrid, insomuch that, when chewed, it excoriates the mouth and fauces. It commonly operates as a cathartic, sometimes as an emetic, and in large doses proves highly deleterious. See HELLEBORUS.

HELLEBORE. See HELLEBORUS.

HELLEBORE (White). See VERATRUM.

HELLEBORUS. Hellebore. A genus of the class polyandria, order polygynia. Calyxless; petals five or more; nectaries two-lipped, tubular; capsules compressed, nearly erect, many-seeded. Eight species; chiefly common to the Levant and South of Europe, but two natives of our own country.

1. H. viridis: with stem many-flowered, leafy; leaves in finger-like divisions; petals spreading. Found in our woods. See Nat. Hist. Pl. CXXIX.

2. H. fœtidus; with many-flowered leafy stem; leaves pedate; petals connivent. Found in our shades: and known in our dispensatories under the name of helleboraster, fetid hellebore, or bears-foot. See HELLEBORASTER.

3. H. niger: with a one or two-flowered scape, nearly naked, leaves pedate. This species is a native of Austria, and is known among medical writers under the name of melampodium, black hellebore, or Christmas rose. The root is the part of the plant medicinally employed: its taste, when fresh, is bitterish and somewhat acrid: it also emits a nauseous acrid smell, but being long kept, both its sensible qualities and medicinal activity suffer very considerable diminution. The ancients esteemed it as a powerful remedy in maniacal cases. At present it is exhibited principally as an alterative, or, when given in a large dose, as a purgative. It often proves a very powerful emmenagogue in plethoric habits, where steel is ineffectual or improper. It is also recommended in dropsies, and some cutaneous diseases.

HELLEBORUS ALBUS. (*helleborus*, from ἐλλέβορος; παρα το τη βορᾳ ἐλειν, because it destroys if eaten). Veratrum album. Elleborum album. White hellebore or veratrum. Veratrum album racemo supradecomposito, corollis erectis, of Linnéus. This plant is a native of Italy, Switzerland, Austria, and Russia. Every part of the plant is extremely acrid and poisonous. The dried root has no particular smell, but a durable, nauseous, and bitter taste, burning the mouth and fauces; when powdered and applied to issues or ulcers, it produces griping and purging; if snuffed up the nose, it proves a violent sternutatory. Gesner made an infusion of half an ounce of this root with two ounces of water; of this he took two drachms, which produced great heat about the scapulæ and in the face and head, as well as the tongue and throat, followed by singultus, which continued till vomiting was excited. Bergius also experienced very distressing symptoms upon tasting this infusion. The root, taken in large doses, discovers such acrimony, and operates by the stomach and rectum with such violence, that blood is usually discharged: it likewise acts very powerfully upon the nervous system, producing great anxiety, tremors, vertigo, syncope, aphonia, interrupted respiration, sinking of the pulse, convulsions, spasms, and death. Upon opening those who have died of the effects of this poison, the stomach discovered marks of inflammation, with corrosions of its internal coat. The ancients exhibited this active medicine in maniacal cases, and it is said with success. The experience of Greding is somewhat similar; out of twenty-eight cases, in which he exhibited the bark of the root collected in the spring, five were cured. In almost every case that he relates, the medicine acted more or less upon all the excretions: vomiting and purging were very generally produced, and the matter thrown off the stomach was constantly mixed with bile; a florid redness frequently appeared on the face, and various cutaneous efflorescences upon the body; and, in some, pleuritic symptoms, with fever, supervened, so as to require bleeding; nor were the more alarming affections of spasms and convulsions unfrequent. Critical evacuations were also very evident; many sweated profusely, in some the urine was considerably increased, in others the saliva and mucous discharges: and uterine obstructions, of long duration, were often removed by its use. Veratrum has likewise been found useful in epilepsy and other convulsive complaints: but the diseases in which its efficacy seems least equivocal are those of the skin, as itch, and different prurient eruptions, herpes, morbus pediculosus, lepra, scrofula, &c.; and in many of these it has been successfully employed both internally and externally. As a powerful stimulant and irritating medicine, its use has been resorted to in desperate cases only, and even then it ought first to be exhibited in very small doses, as a grain, and in a diluted state, and to be gradually increased according to the effects, which are generally of an alarming nature. See VERATRUM.

HELLE'NIA. In botany, a genus of the class monandria, order monogynia. Corol with a double border, the exterior mostly three-cleft; nectary two-leaved or bifid; capsule three-celled, or coriaceous, inflated, sub-globular; calyx spathe-like, campanulate, bifid. Four species, natives of India, with a panicled efflorescence; the flowers white, red, or yellow.

HELLENISM, in language, a phrase in the idiom, genius, or construction of the Greek tongue. This word is only used when speaking of the authors who, writing in a different language, express themselves in a phraseology peculiar to the Greek.

HELLENISTIC LANGUAGE, that used by the Grecian Jews who lived in Egypt and other parts where the Greek tongue prevailed. In this language it is said the Septuagint was

written, and also the books of the New Testament; and that it was thus denominated to show that it was Greek filled with Hebraisms and Syriacisms.

HELLENISTS, HELLENISTÆ, a term occurring in the Greek text of the New Testament, and which in the English version is rendered Grecians. The critics are divided as to the signification of the word. Œcumenius, in his Scholia on Acts vi. 1. observes, that it is not to be understood as signifying those of the religion of the Greeks, but those who spoke Greek, τους ελληνισι φθεγξαμενους. The authors of the Vulgate version, indeed, render it like ours, Græci; but Messieurs Du Port Royal more accurately, Juifs Grecs, Greek or Grecian Jews; it being the Jews who spoke Greek that are here treated of, and who are hereby distinguished from the Jews called Hebrews, that is, who spoke the Hebrew tongue of that time. The Hellenists, or Grecian Jews, were those who lived in Egypt and other parts where the Greek tongue prevailed. It is to them we owe the Greek version of the Old Testament, commonly called the Septuagint, or that of the Seventy. Salmasius and Vossius are of a different sentiment with regard to the Hellenists. The latter will only have them to be those who adhered to the Grecian interests. Scaliger is represented, in the Scaligerana, as asserting the Hellenists to be the Jews who lived in Greece and other places, and who read the Greek Bible in their synagogue, and used the Greek language *in sacris*; and thus they were opposed to the Hebrew Jews, who performed their public worship in the Hebrew tongue; and in this sense St. Paul speaks of himself as a Hebrew of the Hebrews, Phil. iii. 5. i. e. a Hebrew both by nation and language.

HELLENODICÆ, in antiquity, the directors of the Olympian games. At first there was only one; but, in process of time, the number was increased to nine. The place where they assembled was called Hellenodicæum.

HELL-GATE, is a name given, we suppose by English sailors, to a celebrated strait near the W. end of Long Island Sound, 8 miles E. of New York. It is remarkable for its whirlpools. But, at proper times of the tide, a skilful pilot may conduct a ship of any burden through the strait.

HELLESPONT, a narrow strait between Asia and Europe, near the Propontis, which received its name from Helle, who was drowned there in her voyage to Colchis. It is celebrated for the love and death of Leander, and for the bridge of boats which Xerxes built over it when he invaded Greece. It is about 33 miles long, and varies in breadth from half a mile to a mile and an half.

HE'LLISH. *a.* (from *hell.*) 1. Sent from hell; belonging to hell (*Sidney*). 2. Having the qualities of hell; infernal; wicked; detestable (*South*).

HE'LLISHLY. *ad.* (from *hellish.*) Infernally; wickedly; detestably.

HE'LLISHNESS. *s.* (from *hellish.*) Wickedness; abhorred qualities.

HELLOTIA, two festivals, one of which was observed in Crete, in honour of Europa, carried off by Jupiter in the shape of a bull. The other at Corinth, in honour of Minerva, sirnamed Elotis.

HELLOTIS, a very large myrtle garland, carried in procession at the Cretan Hellotia.

HE'LLWARD. *ad.* Toward hell (*Pope*).

HELM denotes defence: as *Eadhelm*, happy defence (*Gibson*).

HELM. *s.* (helm, Saxon.) 1. A covering for the head in war (*Dryden*). 2. The part of a coat of arms that bears the crest (*Camden*). 3. The upper part of the retort (*Boyle*). 4. (helma, Saxon.) The steerage; the rudder (*Ben Jonson*). 5. The station of government (*Swift*).

HELM, a long and flat piece of timber, or an assemblage of several pieces, suspended along the hind-part of a ship's stern-post, where it turns upon hinges to the right or left, serving to direct the course of the vessel, as the tail of a fish guides the body. The helm is usually composed of three parts, viz. the rudder, the tiller, and the wheel, except in small vessels, where the wheel is unnecessary. As to the form of the rudder, it becomes gradually broader in proportion to its distance from the top, or to its depth under the water. The back, or inner part of it, which joins to the stern-post, is diminished into the form of a wedge throughout its whole length, so as that the rudder may be more easily turned from one side to the other, where it makes an obtuse angle with the keel. It is supported upon hinges, of which those that are bolted round the stern-post to the after extremity of the ship are called googings, and are furnished with a large hole on the after-part of the stern-post. The other parts of the hinges, which are bolted to the back of the rudder, are called pintles, being strong cylindrical pins, which enter into the googings, and rest upon them. The length and thickness of the rudder is nearly equal to that of the stern-post.

The rudder is turned upon its hinges by means of a long bar of timber, called the tiller, which is fixed horizontally in its upper end within the vessel. The movements of the tiller to the right and left, accordingly, direct the efforts of the rudder to the government of the ship's course as she advances; which, in the sea-language, is called steering. The operations of the tiller are guided and assisted by a sort of tackle, communicating with the ship's side, called the tiller-rope, which is usually composed of untarred rope-yarns for the purpose of traversing more readily through the blocks or pulleys.

In order to facilitate the management of the helm, the tiller-rope, in all large vessels, is wound about a wheel, which acts upon it with the powers of a crane or windlass.

There are several terms in the sea-language relating to the helm; as, "bear up the helm;" that is, let the ship go more large before the wind: "helm a mid-ship," or "right the helm;" that is, keep it even with the middle

of the ship: "port the helm," put it over the left side of the ship: "starboard the helm," put it on the right side of the ship. See SEAMANSHIP.

HELMET, an ancient defensive armour worn by horsemen both in war and in tournaments. It covered both the head and face, only leaving an aperture in the front secured by bars, which was called the visor. It is still used in heraldry by way of crest over the shield or coat of arms, in order to express the different degrees of nobility by the different manner in which it is borne. Thus, a helmet in profile is given to gentlemen and esquires: to a knight, the helmet standing forward and the beaver a little open: the helmet in profile and open, with bars, belongs to all noblemen under the degree of a duke: and the helmet forward and open, with many bars, is assigned to kings, princes, and dukes.

There is generally but one helmet upon a shield; but sometimes there are two, and even three: if there be two, they ought to face each other; and if three, the middlemost should stand directly forward, and the other two on the sides facing towards it.

HELMET. Galea. In botany, the upper lip of a ringent coral.

HELMET-TUBED PETAL. In botany. Galeato-tubulatum petalum: having the tube shaped like a helmet.

HELMET-FLOWER. In botany. See ACONITUM.

HELMINTHAGOGUES. (*helminthagoga*, ἑλμινθαγωγα, from ἑλμινς, a worm, and αγω, to drive out). Medicines which destroy and expel worms. See ANTHELMINTICS.

HELMINTHI'ASIS. (*helminthiasis*, ἑλμινθιασις, from ἑλμινς, which signifies any species of worms.) A disease in which worms, or the larves of worms, are bred under the skin, or some external part of the body. It is endemial to Martinique, Westphalia, Transylvania, and some other places.

HELMINTHO'LITHUS. In oryctology, a genus of the class petrifactions, order animal. The body or parts of a crustaceous worm or shell-fish changed into a fossile substance. About fifty species found in different parts of the globe, but chiefly in Europe, and a very large proportion of them in the clay-pits and flint and chalk hills of our own country. They consist principally of asturias, sea-hedgehogs, or echinuses, cockles, oysters or scallops, anomias, muscles, nautiluses, whelks, or murexes, tops or trochuses, snails, tubipores, madrepores, corals, and corallines, either wholly or parts of their shells or other substance petrified. The following are those best known or most worthy of attention:

1. H. echinus. Sea hedge-hog.

α. Entire. Found in England, Saxony, Germany, &c. in chalk, lime, marl, flint or agate; sometimes in iron ore.

β. In parts. Jew's-stone. The parts are either knobs, or separate compartments of the shell, or teeth of the shell. Found abundantly in Great Britain, and various other parts of the globe: the spines are longer or shorter, smooth, striated or studded.

2. H. bucardites. Petrified cardium or cockle. Found in the clay-pits at Richmond in Surry, at Sherborne in Gloucestershire, in Warwick-cliff, Shooter's-hill, and in vast masses of grey limestone, near Castle-Saffron, in the county of Cork; in Germany, Italy, Bohemia, Austria, and other parts of the continent.

3. H. anomia. Petrified anomia: of which there are twenty varieties, or perhaps more. The chief are,

α. A. terebratula. Terebratulites. Found fixed or detached in lime or flint, and sometimes filled with spar, near Witney in Oxfordshire, and at Gravesend; in Germany, Saxony, Bohemia, Austria, and most parts of the continent.

β. A. hysterita. Hysterolithus. Found in Sweden, Saxony, and Germany, in flint or sand stone.

γ. A. sandalium. Sandaliolithus. Found in Bohemia and Germany: generally calcareous.

δ. A. perdium. Perdiolithus. Found in Westphalia.

4. H. mytilites. Petrified mytilus or muscle-shell. Thirteen varieties, of which the chief is H. penna pavonis. Petrified peacock's wing. Found near Aristorf in Switzerland, opake, but admitting a most beautiful polish, and exhibiting the most splendid iridescent colours, according to its position in the light.

5. H. nautilites. Petrified nautilus. The varieties and subvarieties are almost innumerable. The most common is H. belemnita, *thunderbolt*, or *thunderstone*: very frequent in many parts of England, particularly in Gloucestershire and Oxfordshire, and in most mountainous parts of Europe: they are more or less opake or transparent, straight or bowed, cylindric, conic, more or less clavate, fusiform, a little compressed, pointed, or rather obtuse, with a groove or two towards the tip, internally hollow or filled up, from a quarter of an inch to eight inches long; colour whitish, amber, grey, brownish, or blackish; they are often inclosed in or adhere to other stones, and are composed of several crusts encircling each other, and are most frequent in chalk, gravel, or clay: when burnt or scraped with a knife they give an odour like rasped horn. The country people have a notion that they are to be found at all times after a thunder-storm, Whence their vernacular name.

6. H. isidis. Petrified coral. Five varieties, and many subvarieties. The most common variety is

α. I. entrocha, or entrochite. Found in England, and almost every part of the continent, sometimes in single separate joints, sometimes connected together into a column, from the size of a pin's head to a finger's length and magnitude. They are more or less transparent in proportion as they contain more or less r...

are striated from the centre to the circumference, and have a cavity in the middle. When powdered they are esteemed very powerful diuretics, and are exhibited in nephritic cases, the dose being as much as will lie on a shilling.

C. I. madrepora asteria, star-stone; also a common variety, and has many subvarieties from differences of its angles. It is found in England, Switzerland, Germany, Austria, single or gregarious, detached or fixed, with the joints solitary or forming a column, which is rarely curved or branched, smooth or warty, rarely three or six-sided, very rarely square; the joints when separated resemble a radiated star; when placed in good vinegar these stones have the property of moving, which is merely occasioned by the effervescence produced by the acid acting upon the calcareous matter of which they are composed.

HELMINTHOLOGY. (from ελμινς ινθος, a worm, and λογος, a treatise or discourse.) Scolecology. The doctrine or natural study of *worms*: as ornithology is that of *birds*, and entomology that of *insects*. Till of late years this division of natural history has not been a subject of much scientific pursuit: and even at present our researches have not enabled us to explain many important phœnomena relating to the animals which constitute this division, nor even to form an unexceptionable classification.

Under the Linnéan system (which is that, notwithstanding its imperfections, to which upon the whole we have deemed it best to adhere) helminthology, as a class, embraces the five following orders:

I. Intestina: consisting of worms of the most simple formation; some of which live within other animals, some in waters, and a few in the earth; the use of many of which appears obvious to us, though in regard to most of them we are ignorant of their advantages. Thus the *gordius* perforates clay to give a passage to springs and water; the *lumbricus* pierces the earth that it may be exposed to the action of air and moisture; the *teredo* penetrates wood, to contribute towards its destruction, so that its elementary principles may promote towards the growth of succeeding vegetables; the *phloas* and *mytilus*, in like manner, penetrate rocks, to effect their dissolution.

II. Mollusca: naked worms, furnished with tentacles or arms, for the most part inhabitants of the sea; illuminating by their phosphoreous power the dark abyss of the waters, and reflecting their lights to the firmament. Thus what is beneath the water corresponding with that which is above.

III. Testacea. Molluscous worms covered with calcareous habitations, or shells which they carry about with them: themselves producing and often penetrating calcareous bodies. Like insects, they are multiplied into a vast number of species and varieties; and both in form and colours exhibit splendid examples of the power of the almighty Artificer.

IV. Zoophyta. Composite animals, holding a medium between animals and vegetables. Most of them take root, and grow up into stems, multiplying life in their branches and deciduous buds, and in the transformation of their animated blossoms or polypes, which are endowed with spontaneous motion. Plants, therefore, resemble zoophytes, but are destitute of animation and the power of locomotion; and zoophytes are, as it were, plants, but furnished with sensation, and the organs of spontaneous motion; of these some are soft and naked, as the polype, and are called proper zoophytes; others are covered with a hard shell, and are hence denominated *lithophytes*.

V. Infusoria. Extremely minute animalcules, destitute of tentacles or feelers, and generally not visible to the naked eye. They are mostly found in infusions of various vegetable substances; and after becoming dry, do not (except in a few instances) revive upon being replaced in moisture.

The anatomical characters, however, of these different orders of animals, and of many of the genera of which these different orders consist, are so various, and in some cases so opposite to each other, that several zootomists, and natural historians of the present day, have endeavoured to improve upon the Linnéan classification, and to re-arrange it into a simpler and more harmonious form. We shall have occasion to revert more at length to this subject in the article ZOOLOGY; and shall here, therefore, only observe that, in general, the term helminthology, or the natural science of worms, is used by writers of the present day in a much more limited sense than is imported by the Linnéan idea: the animals arranged under the name of *vermes*, or *worms*, constituting only a small part of the Linnéan class, not confined to any particular order, though almost exclusively from the first three. Under the system of Blumenbach, the class vermes consists of two orders only.

I. Intestini including,
1. Gordius.
2. Ascaris.
3. Tricocephalus.
4. Fasciola.
5. Tænia.
6. Hydatis.

II. Externi, consisting of
1. Aphrodite.
2. Sipunculus.
3. Hirudo.
4. Nereis.
5. Nais.
6. Planaria.
7. Lumbricus.

The names of these orders are derived from the animals existing or not existing in the organs of other animals: the first belongs obviously to those that are formed or occasionally found there: the second to those which are only traced externally.

The system of Cuvier also contemplates the worm class under two orders, though his characters are drawn from a very different source. The orders are as follow:

I. Possessing external organs for respiration, with setæ upon the sides of the body. This order includes the following genera.

1. Aphrodita.
2. Terebella.
3. Nereis.
4. Serpula.
5. Penecillus.
6. Siliquaria.
7. Amphitrite.
8. Dentalium.

II. Possessing no external organs for respiration: some of them with setæ upon the sides of the body, some without. The genera are as follow:

1. Nais.
2. Lumbricus.
3. Thalassema.
4. Hirudo.
5. Fasciola.
6. Planaria.
7. Gordius.

To which orders M. Cuvier adds an appendix, consisting of animals similar to worms, the organization of which is not sufficiently known to determine whether they should be included in the worm class, or constitute a separate class, next to the zoophytes.

These consist of two families.

A. 1. Tænia.
2. Hydatigena.
3. Ligula.
4. Linguatula.

B. 1. Ascaris.
2. Furia.
3, 4, &c. all the other intestinal worms of Linnéus.

Generally speaking the Linnéan class vermes, but more especially the more confined class of this name, whether of Blumenbach or of Cuvier, possesses a vascular system, and a spinal marow, knotted like that of insects: in some genera the nervous system is very distinct; in others so obscure that we can scarcely recognize its existence.

In the *aphrodita aculeata* it is very obvious. Immediately behind the tentacles, situated above the mouth we observe a large nervous ganglion, which is the brain: it has the form of a heart, the broadest and bilobed part of which is directed backward: the pointed and anterior part produces two small filaments for the tentacles; and the lateral parts form other filaments, which are still more slender, for the parietes of the mouth: this ganglion is situated immediately above the origin of the œsophagus. The two cords which arise from the brain, and form the collar, are very long and delicate; they gradually increase in thickness as they approach the point of their union. Each then produces a large filament, called by Cuvier the recurrent nerve: these nerves are very distinct: they are directed forward towards the part where the œsophagus, which is very short, joins the stomach: they may be easily followed by the naked eye to the lateral parts of that viscus, which is very long and muscular; before they reach the intestines that follow the stomach, they swell into a ganglion, which produces a great number of nervous fibrils. The two nerves of the collar produce a very large ganglion at their union: it is bifurcated anteriorly, and situated immediately behind the mouth and above the œsophagus: it is the anterior extremity of the chief nervous cord. We do not observe any filaments proceeding from it. To this first ganglion another succeeds, which is distinguished from it by only a small contraction: the latter produces two nervous filaments, which go towards the muscles of the abdomen. A series of ganglia, the spaces between which are considerably greater, succeed next: each of these sends off six nerves, three on a side, which are lost in the muscles. These ganglia are twelve in number. The nervous cord which is still prolonged, and occupies the posterior third of the body, no longer exhibits any apparent enlargement: but pairs of nerves are still detached at certain spaces. Finally, this cord may be traced to the extremity of the body.

In the *hirudo* or *leech* genus, the nervous is a longitudinal cord, composed of twenty-three ganglia. The first is seated above the œsophagus: it is small and rounded: anteriorly it produces two slender filaments which proceed above the disk of the mouth. The lateral parts furnish a thick pair of nerves that form a collar round the œsophagus as they proceed downward, and unite at the second ganglion. This ganglion is of a triangular figure: it appears to be formed by the union of two tubercles. Two of these angles are anterior and lateral; they receive the nerves that proceed from the first ganglion. The other is posterior: it is prolonged into a nerve rather more than half a line in length, which produces the third ganglion. The anterior part of the triangular ganglion detaches two small nerves which are lost on the œsophagus around the mouth. The nine succeeding ganglia are precisely of the same form, and produce each two pairs of nerves; they differ only in the greater or less distance at which they are placed in respect to each other. The third is very near the second: the three following are placed at nearly the distance of a line and a half: but those which succeed, from the seventh to the twentieth, are at the distance of three or four lines: finally, the three last are very close together. All these ganglia are situated longitudinally below the intestinal canal, to which they furnish, from their superior surface, a number of nervous filaments; they produce on each side two nerves, which pass into the longitudinal and transverse muscles, in the substance of which they are lost. These nerves run in opposite directions, so that they represent the figure of an X. The coat of these arteries is black and very solid: on this account, before the parts have been immersed in alkohol, the nerves appear like a system of vessels.

In the *lumbricus* or *earth-worm*, the nervous cord derives its origin from a ganglion, situated about the œsophagus: which ganglion is formed of two close, but very distinct

tubercles: it produces a pair of small nerves, which proceed to the parietes of the mouth, and two large cords which embrace the œsophagus in the shape of a collar: these unite to form the nervous cords, the origin of which, therefore, appears bifurcated. Three pairs of small nerves are detached at this place; one from the cord itself, and the others from its lateral parts. They all proceed into the muscles of the mouth. The nervous trunk is continued to the anus along the inferior part of the intestine: its size is not sensibly diminished, and the contractions are not remarkable: there are, in reality, no real ganglia. A pair of nerves arises between each of the rings of the body: these pass under the longitudinal muscles, and disappear between them and the skin. When the nervous cord reaches the anus it terminates by forming a plexus, which is lost on the parietes of that aperture.

In the *gordius argillaceus* there is only a single nervous cord, similar to that in the earthworm; but its contractions are still less conspicuous.

In the *nereis* and *terebella* we find within the skin of the belly a longitudinal cord, which may be regarded as nervous: it has as many contractions as there are rings in the body. No nervous filament has hitherto been traced from this cord.

In the *ascaris lumbricoides*, whether of man or horse, there appear to be two nervous cords observable throughout the whole length of the body on the lateral parts of the abdomen.

The uniform distribution of nearly equal ganglia upon a cord extending throughout the whole length of the body, seems designed to furnish each segment with a brain peculiar to itself. Thus we are gradually conducted to that general diffusion of the medullary substance which takes place in *zoophytes*.

Among *zoophytes* we may observe that a nervous cord is not unfrequently, but by no means always, to be traced. It is conspicuous in the asterias, holothuria and sipunculus, sometimes extending into rings and filaments, but never convoluted into ganglia. In the achinia and medusa we can trace nothing that has any resemblance to a nervous arrangement. In the hydra we only discover a gelatinous and homogeneous pulp, which exhibits no apparent organization. This animal, however, exhibits very distinct sensations; its sense of touch is very delicate, and it is open to impressions of heat and light.

The *microscopic* or *infusory* animalcules appear to approach, in some measure, the nature of polypes, by their uniform and gelatinous structure. In some, however, we are able to trace a more complicated organization, and several kinds of internal viscera.

The organization of the *sepia* is one of the most complicated and extraordinary of the Linnéan class *vermes*: but as we shall find it necessary to examine its structure when describing it in its systematic place, it is unnecessary to enter upon the same subject in this article. See SEPIA.

The *organs of motion* in worms are less perfect than in caterpillars and some other larves of insects. Having neither scaly nor membranous feet, several of them crawl or drag themselves along by the help of stiff hairs or bristles, with which they are wholly or partially covered. Such are the *aphrodita, terebella, nereis, lumbricus,* &c.; others, possessing neither spines nor bristles, are able to move by a peculiar organization in the two extremities of the body, which they apply alternately to the surface on which they crawl. This organization is of two kinds: in leeches and several intestinal worms it consists of suckers possessing a considerable power of contraction, though it is extremely difficult to trace the muscles that move their bodies in obedience to such contraction: in the tænia, tærnea, echinorrhyncus, uncinaria, &c. the head, instead of being terminated by a disk, provided with the power of suction, is generally armed with hooks, by means of which they lay hold of any part to which they wish to attach themselves. The disposition and curvature of these hooks differ very considerably. Among zoophytic worms, motion is in some cases produced by moveable spines on the back, sometimes by an alternate inflation of the body, and sometimes by moveable retractile feet, acting like a sucker with an envelope more or less solid.

HELME'NTRA. In botany, a genus of the class syngenesia, order polygamia æqualis. Receptacle naked; calyx double; the inner eight-leaved, equal; outer five-leaved, as long as the inner: seeds transversely striate; down feathery, on a pedicel. One species only; indigenous to the hedges of our own country, with leaves and calyx fringed with long prickles; the picris echioides of Dr. Smith in his English Botany.

HELMONT (John Baptist Van), a celebrated Flemish gentleman, was born at Brussels, in 1577. He acquired such skill in natural philosophy, physic, and chemistry, that he was accounted a magician, and thrown into the inquisition: but having with difficulty justified himself, as soon as he was released he retired to Holland; where he died in 1644. He published, 1. *De magnetica corporum curatione.* 2. *Febrium doctrina inaudita.* 3. *Ortus medicinæ.* 4. *Paradoxa de aquis spadanis*; and other works, printed together in one volume folio.

HELMONT, a town of Dutch Brabant, with a strong castle. Lat. 51. 31 N. Lon. 5. 37 E.

HELMSDALE, a river in Sutherlandshire, which descends from the mountains bordering on Caithnessshire, and falls into the German ocean.

HELMSLEY, or HELMSLEY BLACKMORE, a town in the West Riding of Yorkshire, with a market on Saturdays. Lat. 54. 19 N. Lon. 1. 10 W.

HELOISE, famous for her unfortunate affection for her tutor Abelard, and for her Latin letters to him after they had retired from the world. She died abbess of Paraclet in 1165. See ABELARD.

HELO'NIAS. In botany, a genus of the

class hexandria, order trigynia. Calyxless; coral six-petalled; capsule three-celled. Two species, natives of North America, herbaceous plants. See Nat. Hist. Pl. CXXXIX.

HELOPS, in the entomology of Fabricius, a tribe of the genus PRIMELIA, which see.

HELOS, in ancient geography, a maritime town of Laconia, situated between Trinasus and Acriæ, in Pausanias's time in ruins. The district was called Helotea, and the people Helotes, Helotæ, Helei, and Heleatæ, by Stephanus; and Ilotæ, by Livy. Being subdued by the Lacedæmonians, they were all reduced to a state of public slavery. Hence the Spartans called the slaves of all nations Helotes or Helots.

HELO'TIUM. In botany, a genus of the class cryptogamia, order fungi. Fungus with a fleshy, membranous, convex hemispherical cap, smooth underneath, and bearing naked seeds. Six species: two indigenous to our own country.

To HELP. *v. a.* preterit *helped* or *holp*; part. *helped* or *holpen*. (helpan, Saxon.) 1. To assist; to support; to aid (*Fairfax*). 2. To remove, or advance by help: *the operation is* helped *by air* (*Locke*). 3. To free from pain or vexation: *the pain is* helped *by medicine* (*Locke*). 4. To cure; to heal (*Shakspeare*). 5. To remedy; to change for the better (*Shakspeare*). 6. To prevent; to hinder (*Swift*). 7. To forbear; to avoid (*Pope*). 8. To promote; to forward (*Bacon*). 9. *To* HELP *to*. To supply with; to furnish with (*Pope*).

To HELP. *v. n.* 1. To contribute assistance (*Dryden*). 2. To bring a supply (*Rymer*).

HELP. *s.* (from the verb; *hulpe*, Dutch.) 1. Assistance; aid; support; succour (*Locke*). 2. That which gives help (*Wilkins*). 3. That which forwards or promotes (*Bacon*). 4. Remedy (*Holder*).

HELPS, in the manage, the aids or collateral assistance or stimulus given to a horse in riding. They usually include the seven following, the voice, whip, bit, calves of the legs, stirrups, spur and ground. See AIDS.

HE'LPER. *s.* (from *help*.) 1. An assistant; an auxiliary (*Kings*). 2. One that administers remedy (*More*). 3. One that supplies with any thing wanted. 4. A supernumerary servant (*Swift*).

HE'LPFUL. *a.* (*help* and *full*.) 1. Useful; that gives assistance (*Dryden*). 2. Wholesome; salutary (*Raleigh*).

HE'LPLESS. *a.* (from *help*.) 1. Wanting power to succour one's self (*Dryden*). 2. Wanting support or assistance (*Pope*). 3. Irremediable; admitting no help (*Spenser*). 4. Unsupplied; void (*Dryden*).

HE'LPLESSLY. *ad.* (from *helpless*.) Without ability; without succour.

HE'LPLESSNESS. *s.* (from *helpless*.) Want of ability; want of succour.

HELSINBURG, a seaport of Sweden, in the province of Schonen. Lat. 56. 6 N. Lon. 12. 40 E.

HELSINGFORS, a town of Swedish Finland, in a romantic situation. The harbour, which is very commodious, is in the Gulf of Finland. Lat. 60. 20 N. Lon. 25. 0 E.

HELSINGIA, a province of Sweden, bounded on the north by Jempterland and Medelpadia, on the east by the Bothnic gulf, and on the south and west by Dalecarlia and Gestricia. It is full of mountains and forests.

HELSTON, a borough in Cornwall, situated on the river Loe, near the sea. It is a large and populous town, of good trade, and one of the places appointed for stamping tin, according to the ancient stannery laws. The magistracy is vested in a mayor, four aldermen, and twenty-four assistants, by charter of queen Elizabeth. It is a borough town, and sends two members to the British parliament, and has a weekly market; twelve miles E. Penzance. Lat. 50. 4 N. Lon. 5. 15 W.

HE'LTER-SKELTER. *ad.* In a hurry; without order; tumultuously (*L'Estrange*).

HELVE. *s.* (from helfe, Saxon.) The handle of an axe. (*Raleigh*.)

To HELVE. *v. a.* (from the noun.) To fit with a helve or handle.

HELVELLA. In botany, a genus of the class cryptogamia, order fungi. Fungus inflated, deformed, or concave, smooth, elastically ejecting its seeds from the upper surface. Sixteen species; of which twelve are natives of our own country.

HELVETIC, something that has a relation to the Switzers, or inhabitants of the Swiss cantons, who were anciently called *Helvetii*.

HELVETIUS (Adrian), a Dutch physician, who settled at Paris, and by his successfully administering ipecacuanha in the dysentery, which raged violently in that city, gained a pension, and the appointment of inspector-general of the military hospitals. He died in 1721, aged 65. He wrote some medical treatises.

HELVETIUS (John Claude), son of the preceding, was born in 1685. He became first physician to the queen of France, and inspector-general of the military hospitals, after his father. He was a man of considerable skill and great humanity. He died in 1755. His works are, 1. Idée générale de l'Economie animale, 1722. 2. Principia Physico, Medicea in tyronum Medicinæ Gratiam Conscripta, 2 vols. 8vo.

HELVETIUS (Claude Adrian), son of the last-mentioned, was born at Paris in 1715. Though his genius expanded itself early, yet it was not till 1758 that he thought proper to give any fruits of it to the world, and then produced his celebrated work, entitled, de l'Esprit, which, on account of its atheistical principles, was condemned by the parliament of Paris. The odium which he incurred hereby induced him to visit England in 1764, and from thence he went to Prussia, where he met with a good reception from the king. On his return to France, he led a retired life in the country, and died in 1771. Besides the above work, he wrote some others, as 1. Le Bonheur, a poem in 6 cantos, 1772. 2. Of

Man, a philosophical work, on the same ground as his first performance. 3. The Child of Nature improved by Chance, an indecent romance. (*Watkins*).

HELVOETSLUYS, a seaport of Holland, on the island of Voorn. It is the place of destination of the English packets from Harwich. Lat. 51. 45 N. Lon. 4. 23 E.

HEM. *s.* (hem, Saxon.) 1. The edge of a garment doubled and sewed to keep the threads from spreading (*Wiseman.*) 2. (*hemmen*, Dutch.) The noise uttered by a sudden and violent expiration of the breath (*Add.*) 3. *Interject.* HEM! (Latin).

To HEM. *v. a.* 1. To close the edge of cloth by a hem or double border sewed together. 2. To border; to edge (*Spenser.*) 3. to enclose; to environ; to confine; to shut (*Fairfax*).

To HEM. *v. n.* (*hemmen*, Dutch.) To utter a noise by violent expulsion of the breath.

HEMATITE. See HÆMATITES.

HEMERALOPIA. (*hemeralopia*, ημεραλωπια, from ημερα, a day, and οπ]ω, to see.) Crepusculary blindness. A defect of vision, in which the patient sees perfectly well all day, but in the crepusculary light, as in the evening, perceives little or nothing. It is often endemic to China, Barbadoes, the Brazils, and Poland.

HEMERALOPS. (*hemeralops*, ημεραλωψ, from ημερα, the day, and ωψ, an eye). One who can see but in the daytime, or when the sun is in full strength.

HEMEROBAPTISTS, a sect among the ancient Jews, thus called from their washing and bathing every day in all seasons; and performing this custom with the greatest solemnity, as a religious rite necessary to salvation. Epiphanius, who mentions this as the fourth heresy among the Jews, observes, that in other points these heretics had much the same opinions as the Scribes and Pharisees; only that they denied the resurrection of the dead, in common with the Sadducees, and retained a few other of the improprieties of these last.

HEMEROBIUS. In zoology, a genus of the class insectæ, order neuroptera. Mouth with a short, horny mandible; the jaw cylindrical, straight, cleft; feelers four, unequal, filiform; without stemmata, or eyes on the crown; wings deflected, not folded; antennas setaceous, projecting, longer than the thorax, which is convex. Thirty-eight species; which may be thus subdivided:

A. Lip cylindrical, membranaceous, annulate; comprising the Fabrician tribe semblis.

B. Lip horny, rounded at the tip, vaulted.

Some of the different species are common to all the quarters of the globe: eight of them found in our own country. Like the ephemeræ, these insects are very short-lived; and in every state of their existence prey with unceasing avidity upon plant-lice: the larve is six-footed, generally ovate and hairy; the pupe mostly folliculate; the eggs are deposited in clusters on the leaves of the plants, each placed on a small gummy pedicel. Many of the species when touched have an excrementitious smell. The colour varies much; that of the body is chiefly yellow, brown, or black, or intermixed, sometimes greenish: the wings are often white. Some of the species are smaller than the common louse; several of them resemble the termes, and perhaps might as well be included under that genus: whence the hemerobius of Fabricius comprises a whole tribe of the genus TERMES, which see. See also Nat. Hist. Pl. CXXXI.

HEMEROCALLIS. Day-lily. In botany, a genus of the class hexandria, order monogynia. Corol campanulate, with a cylindrical tube; calyxless; stamens declining. Four species; one a native of Switzerland, the other three of China and Japan.

1. H. flava. yellow day-lily or lily aspodel. Leaves linear; segments of the corol flat acute, with their nerves undivided. This is the Swedish plant.

2. H. fulva. Tanny day-lily; neres of the outer segments branched; a native of China.

3. H. lancifolia. Lance-leaved day-lily; leaves oblong, tapering to both ends, seven-nerved.

4. H. Japonica, with roundish ovate leaves, pointed, many nerved. Indigenous to Japan, and producing in our own green-houses beautiful white flowers.

Of this last species there is also a beautiful variety, affording blue flowers. See Nat. Hist. Pl. CXXXV.

The two first are the most common, and obtained with most facility. Of these two the former is easily propagated by off-sets, which the roots send out in abundance; these may be taken off in autumn (that also being the best season for transplanting the roots) and planted in any situation; for, being extremely hardy, they will require no other culture than to be kept clean from weeds, and be allowed room to spread their roots. This sort may be propagated also by seeds, which, if sown in autumn, will produce plants the spring following, and these will flower in two years; but if the seeds be not sown till spring, the plants will not come up till the year after. The second species is usually propagated by parting the roots: the proper season for this is autumn, as also for transplanting the roots. These plants should not be transplanted oftener than every third year, when the roots may be parted to make an increase of the plants; but they must not be divided too small, for if they be, it will be two years before they flower. They delight in a light loamy soil, and an open exposure.

HEMERODROMI, compounded of ημερα, day, and δρομ⊕, course, &c. among the ancients, were sentinels or guards appointed for the security and preservation of cities and other places. They went out of the city every morning, as soon as the gates were opened, and kept all day patrolling round the

place; sometimes also making excursions farther into the country, to see that there were no enemies lying in wait to surprise them.

Hemerodromi were also a sort of couriers among the ancients, who only travelled one day, and then delivered their packets or dispatches to a fresh man, who ran his day, and so on to the end of the journey.

HEMEROTROPHIS, in antiquity, a measure of capacity, the same with the chœnix. It was so called from its holding one day's food. The word is compounded of ημερα *a day*, and τροφη *food*.

HEMI, a word used in the composition of various terms. It signifies the same with *semi* or *demi*, viz. *half*; being an abbreviature of ημισυς, *hemisys*, which signifies the same. The Greeks retrenched the last syllable of the word ημισυς in the composition of words; and after their example, we have done so too in most of the compounds borrowed from them.

HEMICRANIA. (*hemicrania*, ημικρανια, from ημισυς, half, and κρανιον, the head). A pain that affects only one side of the head.

HEMICYCLE, Hemicyclium, in architecture, a term applied to semicircular vaults.

Hemicyclium was also a part of the orchestra in the ancient theatre. Scaliger, however, observes, it was no standing part of the orchestra; being only used in dramatic pieces, where some person was supposed to be arrived from sea, as in Plautus's Rudens. The ancients had also a sort of sun-dial, called *hemicyclium*. It was a concave semicircle, the upper end or cusp whereof looked to the north.

HEMIDITONE, in ancient music, the interval of a major-third diminished by half a tone: its constituting ratio is 5 : 6.

HEMIMERIS. In botany, a genus of the class didynamia, order angiospermia. Calyx five-parted; corol wheel-shaped, reversed, gibbous at the base, cloven; filaments glabrous; capsule two-celled. Five species; three natives of the Cape, two of South America: all herbaceous plants; the two last with beautiful scarlet flowers.

HEMINA, formed of ἡμισυς, *half*, a vessel used as a measure among the ancient Romans, containing half the sextary. The *hemina*, called also *cotyla*, and *acetabulum*, contained eight ounces of liquor; and was about half our wine pint.

HEMIOBOLON, in antiquity, a weight of half the obolus, or five grains.

HEMIOLUS, or Hemiolia, among ancient musicians, denotes that ratio which we now call Sesquialteral.

HEMIONITIS. In botany, a genus of the class cryptogamia, order filices. Fructification in decussate, forked, or reticulate lines; involucreless; six species, three with simple and three with compound frond: natives of the East or West Indies.

HEMIOPE, a kind of fistula, having three holes, used by ancient musicians.

HEMIOPSIA. (*hemiopsia*, ημιοψια, from ημισυς, half, and ωψ, an eye.) A defect of vision, in which the person sees the half, but not the whole of an object.

HEMIPLEGIA. (*hemiplegia*, ημιπληγια, from ημισυς, half, and πλησσω, to strike). A paralytic affection of one side of the body. See Paralysis.

HEMIPTERA. In zoology, the second order of the class insecta consistently with the Linnéan system, thus ordinally characterised: mouth and snout beat in towards the breast; upper wings soft semi-crustaceous, not divided by a straight suture, the base of the left covering the inner margin of the base of the right. See Zoology.

HEMISPHERE. *s.* (ημισφαιριον.) The half of a globe, where it is supposed to be cut through its centre in the plane of one of its greatest circles (*Dryden*).

Hemispheres separated by different great circles on the mundane sphere are characterised by different names. Thus, the *equator* separates the *northern* and *southern* terrestrial hemispheres; the *ecliptic*, the *northern* and *southern* celestial hemispheres; the *first meridian*, the *eastern* and *western* hemispheres; and the *horizon*, the *upper* and *lower* hemispheres.

Hemispheres of Magdeburgh, two brass concave hemispheres, one of which is furnished with a cock, by which it may be adjusted to the air-pump. The other has a ring at the middle of its convexity, by means of which it may be suspended. When these two hemispheres are placed together, the air is drawn from within through the medium of the cock by the mechanism of the air-pump; and then, the exhaustion being carried far enough, and the cock turned to prevent the admission of air from without, a considerable force is requisite to separate the hemispheres: the force varying with their external surface. This furnishes an easy and obvious method of proving the force and pressure of the air. Otto Guericke, the inventor of the air-pump, to whom also is due this invention, made hemispheres of about a foot radius, and found that the atmospheric pressure upon them was equivalent to about 5400 pounds.

HEMISPHERIC CALYX, or Nectary. In botany. In form of half a sphere. The first exemplified in *tanacetum*: the second in *narcissus jonquilla*.

HEMISPHEROIDAL, in geometry, something that approaches to the figure of a hemisphere, but is not justly so.

HEMISTICH, compounded of ημισυς, *half*, and στιχος, *verse*, in poetry, a half verse.

Such, e. gr. are, *Cernit Deus omnia vindex*—
or *Medio tutissimus ibis*, &c.

It is disputed, whether or no the hemistichs in the Æneid were left with design; or whether they are owing to the work's being unfinished?

In English, &c. the common and Alexandrine verses require a rest at the end of each hemistich; common verses require it at

the end of four syllables; and Alexandrine at the end of six.

Leonine verses rhythm both at the end and at the hemistich. See LEONINE.

HEMITONE, in music, a semi-tone.

HEMLOCK, in botany. See CICUTA.

HE'MORRHAGE. HE'MORRHAGY. *s.* (αιμοῤῥαγια.) A violent flux of blood. See HÆMORRHAGIA.

HE'MORRHOIDAL. *a.* (from *hemorrhoids.*) Belonging to the veins in the fundament (*Ray*).

HE'MORRHOIDS. *s.* (αιμοῤῥοιδες.) The piles; the emrods (*Swift*).

HEMP, in botany. See CANABIS.

HEMP (Agrimony). See EUPATORIUM.

The canabis sativa, or hemp-plant, is cultivated on account of its external filaments, which constitute the hemp used for cordage, canvas, cloth, &c. and the seeds abound with oil. The plant is annual; it rises quick into a tall slender sort of shrub; its leaves growing by fives or sixes from the same pedicle, are a little jagged, and yield a strong smell, which affects the head. The culture and management of hemp makes a considerable article in agriculture; requiring divers operations, as pulling, watering, beating, and swingling. It is sown in May, in a warm, sandy, rich soil; and is of itself sufficient to destroy weeds on any ground. The first season for pulling hemp is usually about the middle of August, when they begin to pull the male plants, called fimble hemp. But the safer method is to pull it a fortnight or three weeks later, when the male plants have fully shed their farina, without which the seeds will prove only empty husks. At the second pulling, a little after Michaelmas, the female plants, called karle hemp, are taken out of the ground. This karle hemp is laid in the sun to dry, and then housed, for the seed to be thrashed out. The female hemp alone produces seed to perpetuate the kind. The operations of harling, watering, breaking, swingling, and heckling hemp, are very much like those practised in the dressing of flax. The hemp imported into this country chiefly comes from Russia. Amongst it the Riga hemp deserves the preference, which, according to the quality, is divided in rhyne, outshot, pass, and codilla hemp. The Italian, known in this country by the name of Bologna hemp, is of very prime quality, but comes too dear for the consumption of the nothern parts of Europe.

Among us, after the seed is beaten out, the hemp is prepared for the manufacturer, either by *grassing*, that is, lying on stubble or pasture ground, in order to be gradually *dew-ripened*; or, by *water rotting*, for which process clay-pits are preferred to running water. In these the hemp is immersed in bundles, laid both directly, and across, thus, ... for four or five days, according to the fineness of the weather. The next operation is that of *reeding*, namely, the separation of the bark from the *reed*, or woody part, which is effected either by pulling out the reed with the hand, or by drying, and breaking it by machinery, like flax. The hemp is then cleared of its mucilaginous matter, by pouring water through it, and squeezing out the liquid after every affusion, till it be completely divested of those particles.

The next operation is that of *breaking* it, which, in the county of Suffolk, is performed with the aid of certain machinery worked by the hand; when the hemp is beaten in mills; combed or dressed by drawing it through *heckles*, similar to the combs of wool manufacturers; and spun into thread, whence it is made into twine, cordage, cloth, netting, &c.

Beside the strong cloth, and other articles made from it, hemp is of considerable utility for other purposes. The refuse, called *hemp-sheaves*, affords an excellent fuel; and the seeds yield by expression a pure oil, which is peculiarly adapted for burning in chambers, as it is perfectly limpid, and possesses no smell. Another valuable property of hemp is, that it effectually expels vermin from plantations of cabbages; for, if it be sown on the borders of fields, &c. planted with that vegetable, no caterpillars will infest it.

When fresh, hemp has a strong, narcotic smell: the water in which it has been soaked is said to be in a high degree poisonous, and to produce fatal effects immediately after drinking it. The seeds have an unctuous, sweetish taste; they may be triturated with water, or boiled in milk as an emulsion, which is occasionally taken as a domestic remedy in coughs, heat of urine, and similar complaints.

In the eastern climates hemp-leaves are used like opium, and possess similar intoxicating properties. The Russians and Poles, even of the higher classes, bruise or roast the seeds, mix them with salt, and eat them on bread.—Birds, kept in cages, are likewise fond of this oily seed; but they should not be indulged in its constant use, which is apt to render them prematurely old, blind, and at length consumptive. Hemp being an article of extensive utility, various vegetables have been discovered, which may serve as substitutes. Among these are the Canada golden-rod, or *solidago Canadensis*, a perennial plant, that might be easily cultivated in Britain: its stalks are numerous, straight, and grow above five feet in height; they afford very strong fibres, if treated in the same manner as hemp. The sun-flower, or *helianthus*, L. also affords single filaments or fibres, which are said to be as thick and in all respects as strong as small pack-thread.

HE'MPEN. *a.* (from *hemp.*) Made of hemp.

HEMSKIRK or HEEMSKIRK (Martin),

a celebrated Dutch painter, was born in 1498, and studied his art at Rome, after which he returned to his own country, and settled at Haerlem, where he died in 1574, aged 76. His invention was fruitful, which enabled him to paint all kinds of subjects with success; but his figures are generally bad, and he was ignorant of the chiaro-scuro.

Hemskirk (Egbert), called Hemskirk the old, was an excellent painter of droll subjects and conversations.

Hemskirk (Egbert), called the young, was probably the son and disciple of the above. He had abundance of humour, and a whimsical imagination, many of his pieces being representations of the nocturnal meetings of witches and devils. He died in 1704, aged 59.

HEMPSTED, or Hemel Hempsted, a borough town in Herts, with a market on Thursdays. It is seated among hills, on a branch of the Coln. Lat. 51. 47 N. Lon. 12. 14 E.

HEMSTERHUIS (Tiberius), or Hemsterhusius, a learned critic, was born at Groningen in 1685, and at the age of 19 was appointed professor of mathematics and philosophy at Amsterdam. In 1717 he removed to Franeker, where he was appointed Greek professor, to which was afterwards added the professorship of history. In 1740 he went to Leyden, where he occupied the same stations as he had done at Franeker. He died in 1766. He published, 1. the three last books of Julius Pollux's Onomasticon, in 1706, which brought him acquainted with the learned Bentley. 2. Select Colloquies of Lucian. 3. The Plutus of Aristophanes. 4. Part of an edition of Lucian and various other learned works.

HEN, in ornithology. See Phasianus.

Hen (Guinea). See Numidia.

Hen-harrier. See Falco.

Hen-weed (Guinea), in botany. See Petiveria.

Hen-bane. See Hyosciamus.

Hen, signifies the female of domestic fowls, and such as often come near habitations: as hen-sparrow, &c.

Hen-hearted. *a.* (*hen* and *heart.*) Dastardly; cowardly.

Hen-pecked. *a.* (*hen* and *pecked.*) Governed by the wife (*Arbuthnot*).

Hen-roost. *s.* (*hen* and *roost.*) The place where the poultry rest (*Addison*).

HENAULT (John d'), a French poet, was the son of a baker at Paris. He was patronized by the superintendant Fouquet, who gave him the place of receiver of the taxes at Forez. He wrote a satirical poem on Colbert, and several pieces of merit. His conduct was irregular, and his principles libertine, but his death was very penitent. This happened in 1682.

Henault (Charles John Francis), a French writer, was born at Paris in 1685. In 1707 he gained the prize of eloquence at the French academy, and in 1715 he produced a tragedy on the stage, which had a bad success. Mr. Horace Walpole, in 1768, begged it of the author, and printed it at Strawberry Hill. In 1706 he was admitted a counsellor of parliament, and in 1710 president of the first chamber of inquests, and these occupations led him to the study of politics and history. In 1744 he published his chronological abridgment of the History of France, which work has been translated into many languages, and even into the Chinese. He also wrote some very pleasant comedies. Henault died greatly respected in 1771.

HENCE. *ad.* or *interj.* (heonan, Sax. *hennes*, old English). 1. From this place to another (*Roscommon*). 2. Away; to a distance (*Milton*). 3. At a distance; in another place (*Shakspeare*). 4. From this time; in the future (*Arbuthnot*). 5. For this reason; in consequence of this (*Tillotson*). 6. From this cause; from this ground (*Arb.*). 7. From this source; from this original; from this store (*Suckling*). 8. *From hence* is a vitious expression.

To Hence. *v. a.* (from the adverb.) To send off; to dispatch to a distance: obsolete (*Sidney*).

HENCEFO'RTH. *ad.* (henonforð, Sax.) From this time forward (*Milton*).

HENCEFO'RWARD. *ad.* (*hence* and *forward.*) From this time to futurity (*Dryd.*).

HE'NCHMAN. *s.* (hync, a servant, and *man.*) A page; an attendant: obsolete (*Shakspeare*).

To HEND. *v. a.* (henðan, Saxon.) 1. To seize; to lay hold of (*Fairfax*). 2. To crowd; to surround (*Shakspeare*).

HE'NDECAGON. *s.* (ἕνδεκα and γωνία.) A figure of eleven sides or angles.

HENED-PENNY, in our old writers, a customary payment of money instead of hens at Christmas.

HENIOCHAS, in astronomy. See Auriga.

HENLEY, a town in Oxfordshire, with markets on Wednesdays, Fridays, and Saturdays. It is seated on the Thames, over which is a handsome bridge, and sends malt, corn, &c. to London by barges. Lat. 51. 35 N. Lon. 0. 46 W.

Henley, a town in Warwickshire, with a market on Tuesdays. It is seated on the Alne. Lat. 52. 23 N. Lon. 1. 50 W.

Henley (John), well known by the name of orator Henley, was born at Melton Mowbray in Leicestershire, in 1692, and brought up at Cambridge, after which he entered into orders, and became a popular preacher in London; but disgraced himself and his gown by setting up a lecture on Sunday evenings, near Lincoln's-inn fields, admission to which was one shilling each person. He had also another lecture on Wednesdays, on all kinds of subjects, but generally of a political or satirical nature. Henley was a man of some abilities, and published a translation of Pliny's Epistles, and some other works. He died in 1756.

This extraordinary person struck medals,

which he dispersed as tickets to his subscribers: a star rising to the meridian, with this motto, *Ad summa*; and below, *Inveniam viam, aut faciam*. He was author of a weekly paper called the Hyp Doctor, for which he had 100*l*. a year given him. Henley used every Saturday to print an advertisement in the Daily Advertiser, containing an account of the subjects he intended to discourse on the ensuing evening at his Oratory, with a sort of motto before it, which was generally a sneer at some public transaction of the preceding week. Dr. Cobden, one of Geo. II.'s chaplains, having, in 1748, preached a sermon at St. James's from these words, "Take away the wicked from before the king, and his throne shall be established in righteousness;" it gave so much displeasure that the doctor was struck out of the list of chaplains; and the next Saturday the following parody of his text appeared as a motto to Henley's advertisement:

"Away with the wicked before the king,
And away with the wicked behind him;
His throne it will bless
With righteousness,
And we shall know where to find him."

HENNEBERG, a county of Germany, in the circle of Franconia. Mainungen is the capital.

Henneberg, a town of Germany, in the county of the same name. Lat. 50. 40 N. Lon. 10. 38 E.

HENOTICUM, Ἑνωτικον, q. d. *reconciliative*; of ἑνοω, I unite, in church history, a famous edict of the emperor Zeno, published A. D. 482, and intended to reconcile and re-unite the Eutychians with the Catholics.

It was procured of the emperor by means of Acacius, patriarch of Constantinople, with the assistance of the friends of Peter Mongus and Peter Trullo.

The sting of this edict lies here; that it repeats and confirms all that had been enacted in the councils of Nice, Constantinople, Ephesus, and Chalcedon, against the Arians, Nestorians, and Eutychians, without making any particular mention of the council of Chalcedon. It is in form of a letter, addressed by Zeno to the bishops, priests, monks, and people of Egypt and Libya. It was opposed by the Catholics, and condemned in form by pope Felix II.

HENRICHEMONT, a town of France, in the department of Cher. It was the capital of a district which Henry IV. gave to his minister the duke of Sully. Its original name was Bois Belle; but Sully gave it its present name, in gratitude for the privileges which the king had annexed to it. It is seated on the Saudre, 15 miles NNE from Bourges.

HENRY I. king of England, and duke of Normandy, surnamed Beauclerc, on account of his great learning, was the son of William the Conqueror, and the youngest brother of William Rufus and Robert. His engaging person and address, his courage, learning, and eloquence, have been highly celebrated. Robert being in Palestine when William Rufus was killed, in 1100, Henry took advantage of his absence, and caused himself to be crowned king of England, on August 5, 1100; but Robert, at his return, was acknowledged duke of Normandy, and landed at Portsmouth to make good his right to the crown of England. However, Henry came to an agreement with him, by consenting to pay him an annual tribute of three thousand marks. This tribute however being but ill paid, they rekindled the war a short time after; when Henry landing in Normandy, rendered himself master of that duchy, after the battle of Tinchebray, fought on the 27th of September, 1106, in which Robert was defeated and taken prisoner. After which Henry had the cruelty to cause his eyes to be put out, and confined him twenty years in Cardiff castle, in Glamorganshire. He died the 1st of December, 1135, aged sixty-eight, leaving his crown to Maud, or Matilda, his daughter, but was succeeded by Stephen his nephew.

Henry II. king of England, son of Geoffrey Plantagenet, and the empress Maud, or Matilda, the daughter of Henry I. succeeded Stephen the 20th of December, 1154, in the twenty-third year of his age. As the son of Geoffrey Plantagenet, he inherited the French provinces of Anjou, Touraine, and Maine, and afterwards by his marriage with Eleanor, obtained Poictou, Saintogne, Guienne, and Gascony. In his person the Norman and Saxon blood were united, and in him began the race of the Plantagenets, which ended with Richard III.

In 1172 Henry sailed with a numerous fleet to Ireland, and landing at Waterford, all the Irish princes voluntarily swore allegiance to him, so that he became master of that kingdom without bloodshed, and divided great part of the country among the English nobles, &c. who attended him in this expedition, and from them sprung some of the principal families now in Ireland. The king had for some years before met with continual disturbance from the arrogance of Thomas Becket, whom he had raised from a mean station to the see of Canterbury; but at last four knights, thinking to please his majesty, murdered that insolent prelate. But what is more extraordinary, the pope's legate prevailed on the king to do penance, by going bare-foot three miles to Becket's shrine: and to be scourged there by the Augustine monks, who gave him fourscore lashes on his naked back.

Henry was brave, learned, polite, generous, and of a mild disposition; but these virtues could not secure him from suffering the greatest vexations, even in his own family. Lust was his predominant passion; and Eleanor his queen being jealous of Rosamond, the lord Clifford's daughter, who was his mistress, and whom he kept at Woodstock, in a labyrinth, built to secure her from the queen's rage, is said to have found means to dispatch her by poison; and the young princes, his sons, being joined by several of the nobility,

and assisted by the kings of France and Scotland, raised a great rebellion. King Henry however took the king of Scotland prisoner, and afterwards not only restored the young princes to favour, but pardoned all the revolters; however, he obliged the king of Scotland to pay him homage for his kingdom. Henry was so mortified at the disobedience of his sons, that through grief he fell sick at Chinon, in Touraine, and perceiving his end draw near, gave orders for his being carried into the church, where he expired before the altar, on the 6th of July, 1189, in the fifty-seventh year of his age, and the thirty-fifth of his reign. After which he was stripped by his ungrateful attendants, and left naked in the church; but was afterwards interred at Fontevraud, in Anjou. He was succeeded by his son Richard I.

HENRY III. king of England, commonly Henry of Winchester, from his being born in that city, was born October 1, 1207, and succeeded his father king John, the 28th of October, 1216, when not ten years of age. Lewis, the dauphin of France, afterwards king Lewis VIII. who was called in by the barons against king John, was then in England; but having received a large sum of money, returned into France. When Henry was of age, he began with exacting large sums of money, and annulling the two sacred charters granted by his father. He landed in Brittany with a numerous army, in order to recover the British dominions in France; but spending his time in diversions, shamefully returned, after having spent all his treasure: afterwards renewing the war, he lost all Poictou, and then concluded a peace with Lewis for five years, to purchase which Henry agreed to pay him five thousand pounds annually.

The king, who paid no regard to the constitution of England, met with many mortifications from his parliament and people, who at length obliged him to renew the two charters; which was done in Westminster-hall, in the following manner, viz. the peers being assembled in the presence of the king, each holding a lighted taper, the archbishop of Canterbury denounced a terrible curse against those who should violate the laws, or alter the constitutions of the kingdom; then the charters were read aloud, and confirmed by the king, who all this time kept his hand upon his breast; after which every one threw his taper on the ground to raise a great smoke, and wished that those who violated the charters might smoke in hell. After which, the parliament granted him a subsidy for suppressing an insurrection in Guienne. He soon reduced that province, and returned to England, where he renewed his exactions. In short, the people being still oppressed, and the barons finding that Henry could not be bound by the most solemn oaths, undertook to reform the government; accordingly commissioners were chosen by the king and the barons, and articles agreed on; which the king again broke. At last they came to an open war, when a decisive battle was fought near Lewes, in Sussex, in which the king's army was defeated, and himself, prince Edward, and the king of the Romans, taken prisoners; but afterwards the earls of Leicester and Gloucester quarrelling, the latter joined prince Edward, who had escaped from his keepers, and uniting their forces, marched against the earl of Leicester, whom they defeated and slew: the king was then set at liberty; but peace was not restored till some time after; when prince Edward engaged in a crusade, and went to the Holy Land. Henry died at London, on the [illegible]th of November, 1272, aged sixty-five, in the fifty-sixth of his reign, and was buried in Westminster-abbey. He was succeeded by his son Edward Longshanks.

HENRY IV. king of England, was born in 1367, and proclaimed king after the deposition of Richard II. on the 30th of December, 1399. He was the son of John of Gaunt, duke of Lancaster, third son of Edward III. He had not a just claim to the crown, which of right belonged to Edmund of Mortimer, earl of March, then duke of York, the descendant of Lionel, duke of Clarence, the second son of Edward III. which occasioned the wars between the houses of York and Lancaster, under the device of the white rose and red. The next year, the dukes of Exeter, Surry, and Albemarle, the earls of Salisbury and Gloucester, the bishop of Carlisle, and sir Thomas Blount, the friends of Richard, formed a conspiracy, in order to assassinate Henry, and restore Richard to the throne: but being discovered, and their whole scheme frustrated, they assembled an army of forty thousand men, and set up Maudlin, a priest, whose person resembled Richard, to pretend that he was Richard himself; but in this they also failed: most of the leaders were taken and beheaded; Maudlin was hanged at London, and this conspiracy hastened the death of the unhappy king Richard, who was soon after basely murdered at Pontefract. In 1402, Henry caused Roger Clarendon, the natural son of Edward the Black Prince, and several others, to be put to death, for maintaining that Richard was alive. The same year he married Joanna of Navarre, widow of the duke of Brittany.

About this time the Scots invaded England, under the earl of Douglas, but were defeated at Halidown-hill, by the earl of Northumberland, and his son Henry Hotspur, with the loss of above ten thousand men; and in this victory several earls, and many other persons of consequence, were made prisoners; but the king ordering Northumberland to deliver up the prisoners into his hands, the earl was so exasperated, that he, with Henry Piercy, surnamed Hotspur, his son, and other lords, agreed to crown Edmund Mortimer, earl of March, whom Glendower kept prisoner in Wales. The rebel army were encamped near Shrewsbury, headed by Henry Hotspur, the earl of Worcester, and the Scotch earl of

Douglas; and the king marched directly thither, with fourteen thousand choice troops, headed by himself, the prince of Wales, and the earl of March; and on the 22d of July, at a place afterwards called Battle-field, the king obtained so complete a victory, that about ten thousand of the rebels were killed, among whom was the brave Hotspur, who fell by the hands of the prince of Wales. In 1405, another conspiracy was raised, at the head of which was the archbishop of York, the earl of Northumberland, Thomas Mowbray earl marshal, and other noblemen, who assembled a large body of troops at York, and published a manifesto, declaring the king a traitor, and that they were resolved to place Mortimer, the lawful heir, on the throne. But this rebellion was soon suppressed by the policy of Ralph Nevill, earl of Westmoreland.

Henry died in the Jerusalem-chamber at Westminster, on the 20th of March, 1413, in the forty-sixth year of his age, and the fourteenth of his reign, and was interred in the cathedral at Canterbury. He was succeeded on the throne by his son Henry V.

HENRY V. the eldest son of king Henry IV. was born at Monmouth, in 1388, and succeeded his father in 1413. Though wild and unruly in his youth, he no sooner obtained the crown, than he proved himself a wise and a warlike prince. He chose a council of state composed of men of distinguished wisdom, and commanded those who had been the companions of his irregularities, either to change their manners, or never to approach his person. He revived the English title to the crown of France, and in 1415 embarked his army, amounting to fifteen thousand men, and having landed at Havre de Grace, laid siege to Harfleur, which surrendered in five weeks. Soon after, the French king having assembled an army six times as numerous as that of Henry's, challenged him to fight, and Henry consented, though the French army consisted of one hundred and fifty thousand men, and the English were reduced by sickness to nine thousand. The French therefore made rejoicings in their camp as if the English were already defeated, and even sent to Henry to know what he would give for his ransom; to which he replied, "a few hours would shew whose care it would be to make that provision." The English, though fatigued with their march, sick of a flux, and almost starved for want of food, were inspired by the example of their brave king, and resolved to conquer or die. On the 25th of October, 1415, the king being encamped near Agincourt, drew up his small army into two lines, the first commanded by the duke of York, and the second by himself; he disposed his few men to such advantage, and behaved with such extraordinary conduct and courage, that he gained a complete victory, after having been several times knocked down, and in the most imminent danger of losing his life. The English killed upwards of ten thousand men, and took more prisoners than they had men in the army. The loss of the English was only four hundred men. In 1417 the king, to enable himself to carry on the war, pledged his crown for one hundred thousand marks, and part of his jewels for ten thousand pounds; then landing at Beville, in Normandy, he reduced Caen, and the next year subdued all Normandy. In May 1420, a treaty was concluded at Troyes, which was ratified by the states of France. By this treaty, the dauphin was disinherited; and Henry V. married Catharine of France; and was declared regent of that kingdom till the death of Charles VI. when he was to take possession of that crown. But notwithstanding this treaty, the war was continued by the dauphin, and the next year Henry advanced into France with thirty thousand men; but while he was marching towards the river Loire, he was seized with a pleuretic fever, and was carried to Vincennes, where he expired the 31st of August, 1422, in the thirty-fourth year of his age, and the tenth of his reign. His body was conveyed to England, and interred in Westminster abbey.

The queen dowager some time after married Owen Tudor, a Welsh gentleman, by whom she had Edmund, the father of Henry, earl of Richmond, who became king of England under the name of Henry VII.

HENRY VI. was born at Windsor, December 6, 1421, and succeeded his father Henry V. in 1422, when but fourteen months old, and reigned in England under the tutelage of his uncle Humphrey, duke of Gloucester, and in France under that of his uncle the duke of Bedford. This unhappy prince was unsuccessful both at home and abroad. His misfortunes began in France by the death of his grandfather Charles VI. not quite two months after the death of his father king Henry, which gave great advantage to the dauphin, who was called Charles VII. and being crowned at Poictiers, disputed with Henry the crown of France, yet for some time the English continued to have great success in that kingdom, and gained the famous battles of Crevant, Verneuil, and Rouvroi; and every thing seemed to promise the entire possession of France, when it was prevented by an unforeseen blow. A girl, known by the name of Joan of Arc, or the Maid of Orleans, suddenly appeared at the head of the French army, and, in 1429, made the English raise the seige of Orleans. From that moment Henry's interest in France declined. However, he was carried to Paris, and crowned there with a double crown in the cathedral church, on the 27th of November, 1431. In 1444 a truce of eighteen months was concluded between the two crowns; after which king Henry married Margaret of Anjou, the daughter of Renatus, king of Naples; this was the source of many of his misfortunes; for the king being of a mild and easy temper, and the queen a high-spirited woman, she undertook with her favourites to govern the kingdom. The English were now every where defeated, and in 1541 we had no places left in France but Calais, and the earldom of

Guines. These losses were principally occasioned by the civil wars which broke out in England. Richard, duke of York, who descended on the mother's side from Lionel, the second son of Edward III. claimed a better right to the crown than Henry, who was descended from John of Gaunt, duke of Lancaster, the third son of the same Edward. Henry was defeated and made prisoner at St. Alban's, by Richard Plantagenet, duke of York, on the 31st of May, 1455, and a second time at the battle of Northampton, on the 19th of July, 1460. The parliament then determined that Henry should keep the crown, and be succeeded by the duke of York; but queen Margaret afterwards raised an army in the north, and gained the battle of Wakefield, in which the duke of York was killed, and her husband delivered. This turned the scale, and sunk the interest of the house of York. However, Edward, earl of March, the son of Richard, duke of York, revived the quarrel, and gained a bloody battle at Mortimer's Cross, near Ludlow. In short, the earl of March, after several engagements, was proclaimed king by the name of Edward IV. by means of the earl of Warwick, called the setter up and puller down of Kings. Henry was taken in disguise, brought in the most ignominious manner to London, and confined in the Tower, where, in 1471, he was murdered, when fifty-two years of age.

HENRY VII. king of England, son of Edmund, earl of Richmond, and of Margaret of the house of Lancaster. He took up arms against Richard III. and gained the battle of Bosworth, in which Richard was slain, the 22d of August, 1485, and was crowned king of England the 30th of September following. He married Elizabeth, daughter of Edward IV. by which the claims of the houses of York and Lancaster were united. However, fresh troubles broke out, and the enemies of Henry attempted twice to dethrone him, by setting up two pretenders. The first was one Lambert Simnel, a baker's son, who assumed the title of earl of Warwick, and pretended to be the son of the duke of Clarence, brother to Edward IV. but being defeated and taken prisoner, was make king Henry's turnspit: the other was an adventurer, named Perkin Warbeck, who pretended to be Richard duke of York, Edward the Fifth's brother, who was murdered in the Tower, and being at length taken prisoner, was hanged at Tyburn. Henry assisted the emperor Maximilian against Charles VIII. of France; he made a war on the Scots; instituted the band of gentleman pensioners; built the noble chapel adjoining to Westminster-abbey, which still bears his name; and founded several colleges, by which he obtained the character of a pious prince, and a friend to learning; though he was remarkable for his avarice, and oppressing the [illegible] by numberless exactions. He died at [illegible]mond palace, which he had caused to be [illegible] the 22d of April, 1509, aged fifty-two, [illegible] twenty-fourth year of his reign, and was succeeded by his son Henry VIII. He also left two daughters, Margaret, who married James IV. king of Scotland, and Mary, who married the French king, Lewis XII.

HENRY VIII. succeeded his father, the preceding monarch, at the age of 18. The first years of his reign were very popular, owing to his great generosity, but at length his conduct grew capricious and arbitrary. The emperor Maximilian and pope Julius II. having made a league against France, persuaded Henry to join them, and he in consequence invaded that kingdom, where he made some conquests, and returned to England with a great many prisoners. About the same time James IV. king of Scotland invaded England, but was defeated and slain by Henry at Flodden-field. Henry's minister, Wolsey, succeeded in bringing him over from the Imperial interest to that of the French king. When Luther commenced the reformation in Germany, Henry's zeal was stirred up to defend the tenets of the Romish church, and he accordingly published a book against the reformer, for which he was complimented by the pope with the title of *Defender of the faith*, a title which has been adopted by the kings of England ever since. The work was printed, and intitled Assertio septem Sacramentorum adversus Martyn Luther, edita ab invictissimo Angliæ et Franciæ Rege et de Hybernia ejus nominis Octavo. Henry's attachment, however, to the papal see did not last long; for having conceived an affection for Anne Boleyn, he determined to divorce his wife Catharine of Arragon, to whom he had been married 18 years. His plea for the divorce was that Catharine was his brother Arthur's widow. This, however, was not admitted by the pope, and Henry not being in a humour to suppress his desires, renounced the papal authority, assumed the title of supreme head of the English church, put down the monasteries, and alienated their possessions to secular purposes. He soon after married Anne Boleyn; but at the end of no long period he brought her to the scaffold, and married lady Jane Seymour, who died in child-bed. He then married Ann of Cleves; but she not proving agreeably to his expectations he put her away, and caused Cromwell, earl of Essex, who had projected the match, to be beheaded: after this he espoused Catharine Parr, who had the good fortune to survive him. Henry died in 1547, and was succeeded by his son Edward VI. He was a man of strong passions, and considerable learning; but his character has been well appreciated in this declaration, "that he never spared man in his anger, nor woman in his lust." (*Watkins*).

HENRY (Philip), a pious English divine, was born at London in 1631, and educated at Westminster-school under the celebrated Dr. Busby; from this seminary he was removed to Christ-church, Oxford, after which he received presbyterian ordination, and settled as a minister at Worthenbury, in Flintshire; but at the Restoration he was silenced for nonconformity. After a most exemplary and useful

life, he died at Broad-oak, in Shropshire, June 24, 1696. An account of the life and death of this excellent man, with a dedication by Dr. Bates, has gone through many editions; and is very interesting not only on account of the many pious and sententious reflections which it contains, but because it in many respects elucidates the history of a very eventful period.

Henry (Matthew), a celebrated nonconformist divine, was the son of the above, and born in 1662. He received the principal part of his education under his father, and having made a considerable progress in learning, entered at Gray's-inn; but his turn being for divinity, he renounced the study of the law, and became a dissenting minister at Chester, where he resided many years, and then removed to Hackney. He died at Nantwich in 1714, and his remains were interred at Chester in Trinity church. Mr. Henry was an excellent writer, and his books on practical divinity are deservedly held in great estimation by all classes of Christians. His chief work is an Exposition of the Bible, in 5 vols. folio; which shews him to great advantage as a judicious and pious commentator. (*Watkins*).

Henry of Huntingdon, an English historian, of the 12th century, was canon of Lincoln, and afterwards archdeacon of Huntingdon. He wrote, 1. A History of England, which ends with the year 1154. 2. A continuation of that of Bede. 3. Chronological tables of the kings of England. 4. A small treatise on the contempt of the world. 5. Several books of epigrams and love-verses. 6. A poem on herbs; all which are written in Latin. His invocation of Apollo and the goddesses of Tempe, in the exordium of his poem on herbs, may not be unacceptable as a specimen of his poetry:

> Vatum magne parens, herbarum Phœbe repertor.
> Vosque, quibus resonant Tempe jocosa Deæ!
> Si mihi serta prius hedera florente parastis,
> Ecce meos flores, serta parate fero.

HEP-TREE, in botany. See Rosa.

HEPAR. (*hepar*, ηπαρ, the liver.) See Liver.

Hepar antimonii. See Oxydum stibii sulphuratum.

Hepar sulphuris. Liver of sulphur. This is a sulphuret made either with potash or soda. It has a disagreeable fetid smell, but is in high esteem as a medicine to decompose corrosive sublimate when taken into the stomach.

HEPATALGIA. (*hepatalgia*, ηπαταλγια, from ηπαρ, the liver, and αλγος, pain.) Pain in the liver.

HEPATIC. Any thing belonging to the liver.

Hepatic air. Hepatic airs consist of hydrogen combined with sulphur, which exists in very different proportions. Where each ingredient is combined merely to saturation, it is called simply sulphurated hydrogen; but where the sulphur is in excess, it is termed super-sulphurated hydrogen. Sulphurated hydrogen combined with any base forms a hydro-sulphuret, and may be also called an hepatule, to distinguish it from an hepar, which is the union of sulphur singly with a basis.

Hepatic artery. Arteria hepatica. The artery which nourishes the substance of the liver. It arises from the cœliac, where it almost touches the point of the lobulus Spigelii. Its root is covered by the pancreas; it then turns a little forwards, and passes under the pylorus to the porta of the liver, and runs betwixt the biliary ducts and the vena portæ, where it divides into two large branches, one of which enters the right, and the other the left lobe of the liver. In this place it is inclosed along with all the other vessels in the capsule of Glisson.

Hepatic duct. Ductus hepaticus. The trunk of the biliary pores. It runs from the sinus of the liver towards the duodenum, and is joined by the cystic duct, to form the ductus communis choledochus. See Biliary ducts.

Hepatic veins. See Cavæ hepaticæ, and Vena portæ.

HEPATICA. (*hepatica*, from ηπαρ, the liver, so called because it was thought to be useful in diseases of the liver.) The herb liverwort. See Anemone.

Hepatica nobilis. Herba trinitatis. Hepatica or herb trinity. This plant, anemone hepatica of Linnéus, possesses mildly adstringent and corroborant virtues, with which intentions infusions of it have been drunk as tea, or the powder of the dry leaves given, to the quantity of half a spoonful at a time. See Anemone.

Hepatica terrestris. Jecoraria. Liver-wort. This is a species of marchantia polymorpha, a very common moss. It has a penetrating though mild pungency, and bitter taste, sinking, as it were, into the tongue. It is recommended as an aperient, resolvent, and antiscorbutic, and, though seldom used in this country, appears to be a plant of no inconsiderable virtue. See Marchantia.

HEPATICE, in botany, an order of the class cryptogamia, including those genera characterised by being frondose herbs with capsules without lid or veil. See Botany.

HEPATICUS. In mineralogy, a genus of the class earths, order calcareous: consisting of carbonat of lime, baryt, sulphuric acid, and inflammable matter; soft lamellar, of a common form; either spontaneously or when rubbed giving out an odour like liver of sulphur; not effervescing with acids; crumbling to powder in a small degree of heat, which forms a paste with water, and hardens in the air. Three species; not very essentially differing: one compact, and receiving a polish; one opaque, but shining internally; one shining externally, diaphonous, and of smoke colour. All found in Norway and Bohemia.

HEPATITIS. (*hepatitis*, ηπατιτις, from ηπαρ,

the liver.) Inflammation of the liver. A genus of diseases in the class pyrexiæ, and order phlegmasia, of Cullen. It is characterized by pyrexia, tension, and more or less of acute pain in the right hypochondrium, which is frequently referred to the top of the right shoulder, and increased by lying on the left side; the urine is high coloured.

HEPATIRRHŒA. (*hepatirrhœa*, ηπατιρροια, from ηπαρ, the liver, and ρεω, to flow.) A species of diarrhœa. See DIARRHŒA.

HEPATOCELE. (*hepatocele*, ηπατοκηλη, from ηπαρ, the liver, and κηλη, a tumour.) An hernia, in which a portion of the liver protrudes through the abdominal parietes.

HEPATORIUM. The same as eupatorium.

HEPATOSCOPIA, in antiquity, a general name for divination by entrails.

HEPATULE. See HEPATIC AIR.

HEPHESTIA, an Athenian festival in honour of Vulcan.

HEPHTHEMIMERIS. (composed of επτα, seven; ημισυς, half; and μερος, part.) In the Greek and Latin poetry, a sort of verse consisting of three feet and a syllable; that is, of seven half feet.

Such are most of the verses in Anacreon.

Θελω	λεγειν	Ατρει	δας,
Θελω	δε Καδ	μον α	δειν, &c.

And that of Aristophanes, in his Plutus:

Επεσθε μητρι χοιροι.

They are also called trimetri catalectici.

HEPHTHEMIMERIS, or HEPHTHEMIMERES, is also a cæsura after the third foot; that is, on the seventh half-foot.

HEPIOLUS. In entomology, a tribe of the genus phalæna, as arranged by Fabricius. See PHALÆNA.

HEPPENHEIM, a town of Germany, in the electorate of Mentz, with a castle and an abbey. Lat. 49. 29 N. Lon. 8. 41 E.

HEPTACA'PSULAR. *a.* (επτα and *capsula*, Latin.) Having seven cavities or cells.

HEPTACHORD, of επτα, seven, and χορδη, in the ancient poetry. Heptachord verses were those sung, or played, on seven chords; that is, in seven different notes or tones; and, probably, on an instrument with seven strings.

HEPTAGON, in geometry, a figure of seven sides and seven angles. When those sides and angles are all equal, the heptagon is said to be regular, otherwise it is irregular.

In a regular heptagon, the angle at the centre is $= 51^\circ\frac{3}{7}$, the angle of the polygon is $= 128^\circ\frac{4}{7}$, and its half $64^\circ\frac{2}{7}$. Also the area is = the square of the side $\times$ 3·6339124 or = $AB^2 \times \frac{7}{4} t$, where t is the tangent of the angle CAB of $64^\circ\frac{2}{7}$ to the radius 1.

HEPTAGONAL NUMBERS, are a kind of polygonal numbers in which the difference of the terms of the corresponding arithmetical progression is 5. Thus,

Arithmeticals, 1, 6, 11, 16, 21, 26, &c.
Heptagonals, 1, 7, 18, 34, 55, 81, &c.

where the heptagonals are formed by adding continually the terms of the arithmeticals, the them, whose common difference is 5.

One property, among many others, of these heptagonal numbers is, that if any one of them be multiplied by 40, and to the product add 9, the sum will be a square number.

Thus $1 \times 40 + 9 = 49 = 7^2$;
and $7 \times 40 + 9 = 289 = 17^2$;
and $18 \times 40 + 9 = 729 = 27^2$;
and $34 \times 40 + 9 = 1369 = 37^2$; &c.

Where it is remarkable that the series of squares so formed is 7^2, 17^2, 27^2, 37^2, &c, the common difference of whose roots is 10, the double of the common difference of the arithmetical series from which the heptagonals are formed.

HEPTAMERIS, in the ancient music, the seventh part of a meris.

HEPTANDRIA, in botany, (επτα, seven, and ανηρ, a husband.) The seventh class in the system of Linnéus, comprehending those plants which have seven stamens to the flowers. See BOTANY.

HEPTANGULAR, in geometry, an appellation given to figures which have seven angles.

HEPTAPHONOS, the name given to one of the ten musical notes used in the middle ages.

HEPTAPHYLLUM. (*heptaphyllum*, from επτα, seven, and φυλλον, a leaf.) See TORMENTILLA.

HEPTARCHY, compounded of the Greek επτα, seven; and αρχη, *imperium*, government: a government composed of seven persons, or a country governed by seven persons, or divided into seven kingdoms. The Saxon heptarchy included all England, which was cantoned out into seven petty independent kingdoms, peopled and governed by different clans and colonies; viz. those of Kent, the South Saxons, West Saxons, East Saxons, Northumberland, the East Angles, and Mercia. The heptarchy was formed by degrees from the year 455, when first the kingdom of Kent was erected, and Hengist assumed the title of king of Kent immediately after the battle of Eglesford; and it terminated in 827 or 828, when king Egbert reunited them into one, made the heptarchy into a monarchy, and assumed the title of king of England. It must be observed, however, that though Egbert became monarch of England, he was not perfectly absolute. The kingdom which he actually possessed consisted of the ancient kingdoms of Wessex, Sussex, Kent, and Essex, that had been peopled by Saxons and Jutes. As for the other three kingdoms, whose inhabitants were Angles, he contented himself with preserving the sovereignty over them, permitting them to be governed by kings, who were his vassals and tributaries. The government of the heptarchy, reckoning from the founding of the kingdom of Mercia, the last of the seven Anglo-Saxon kingdoms, lasted 243 years; but if the time spent by the Saxons in their conquests from the arrival of Hengist in 449 be added, the heptarchy will be found to have lasted 378 years from its commencement to its dissolution. The causes of the dissolution of the heptarchy were, the great inequality among the seven kingdoms;

three of which greatly surpassed the others in extent and power; the default of male heirs in the royal families of all the kingdoms, that of Wessex excepted; and the concurrence of various circumstances which combined in the time of Egbert.

HER. *pronoun.* 1. Belonging to a female; of a she; of a woman (*Cowley*). 2. The oblique case of *she*.

HERS. *pron.* This is used when it refers to a substantive going before: as, *such are* her *charms, such charms as* hers (*Cowley*).

HERACLEA, an ancient seaport of Romania, with a Greek archbishop's see. It was formerly very famous, and known by the name Perinthus; there are still considerable remains of its former grandeur. Lat. 40. 59 N. Lon. 27. 58 E.

HERACLEUM. Cow-parsnep. In botany, a genus of the class pentandria, order digynia. Fruit elliptic, notched, compressed, striate, dilated in the margin; flowers radiant; petals notched, with an inflected point; general involucre deciduous. Ten species: all natives of Europe except H. heberosum, which is a plant of Chili. One is common to our own country and found wild in our thickets, H. spendilium, with pinnate leaves; leaflets in five oblong, pinnatifid, acute, toothed segments. There is a variety with long narrow leaflets; and both were often called among medical writers of former times brania ursina, or brank ursine.

HERACLIA, an Athenian festival celebrated every fifth year in honour of Hercules.

HERACLIDÆ, in antiquity, the descendants of Hercules, whom the Greeks called Ἡρακλης, Heracles, from Ἡρα, Juno, and κλεος, glory; on account of the glory he acquired by executing what Juno induced him to undertake.

The Heraclidæ were expelled from Peloponnesus by Euristheus, king of Mycenæ, after the death of Hercules.

HERACLIDÆ (Return of the) into Peloponnesus, is a celebrated epocha in the ancient chronology. This return is generally believed to have happened 80 years after the Trojan war, or 1190 years before the Christian æra. Calistes, Cumanus, Ephorus, and Theopompus, begin their histories at this period; and we have no accurate profane histories of preceding times.

HERACLITUS, a celebrated Greek philosopher of Ephesus, who flourished about 500 years before the Christian æra. Naturally of a melancholy disposition, he passed his time in a solitary and unsocial manner, and received the appellation of the mourner, from his weeping at the follies of mankind. He supposed that there was a fatal necessity, and that the world was created from fire. His opinions about the origin of things were adopted by the Stoics. To remove himself totally from the society of mankind he retired to the mountains, where, for some time, he fed on grass. Such a diet was soon productive of a dropsical complaint, and the philosopher revisited the town. The enigmatical manner in which he consulted the physicians made his applications unintelligible, and he was left to depend for cure only upon himself. He fixed his residence on a dunghill, in hopes that the continual warmth which proceeded from it might dissipate the watery accumulation, and restore him to the enjoyment of his former health. Such a remedy proved ineffectual, and the philosopher died in the 60th of his age.

HERÆA, an ancient festival celebrated at Argos, in honour of Juno.

HERALD, according to Verstegan, is derived from the Saxon word *herehault*, and by abbreviation *herault*, which in that language signifies the champion of an army; and, growing to be a name of office, it was given to him who, in the army, had the special charge to denounce war, to challenge to battle and combat, to proclaim peace, and to execute martial messages. But the business of heralds with us is as follows: viz. To marshal, order, and conduct all royal cavalcades, ceremonies at coronations, royal marriages, installations, creations of dukes, marquisses, earls, viscounts, barons, baronets, and dubbing of knights; embassies, funeral processions, declarations of war, proclamations of peace, &c.: to record and blazon the arms of the nobility and gentry; and to regulate any abuses therein through the English dominions, under the authority of the earl marshal, to whom they are subservient. The office of Windsor, Chester, Richmond, Somerset, York, and Lancaster heralds, is to be assistants to the kings at arms, in the different branches of their office; and they are superior to each other, according to creation, in the above order.

Heralds were formerly held in much greater esteem than at present, and were created and christened by the king, who pouring a gold cup of wine on their head, gave them the herald-name; but this is now done by the earl-marshal. They could not arrive at the dignity of herald without having been seven years poursuivant; nor could they quit the office of herald, but to be made king at arms.

The three chief heralds are called Kings at Arms, the principal of which is Garter, the next is called Clarencieux, and the third Norroy; these two last are called provincial heralds.

HERALD signifies also, 1. A precursor; a forerunner; a harbinger (*Shakspeare*). 2. A proclaimer; a publisher (*Shakspeare*).

To HE'RALD. *v. a.* (from the noun.) To introduce as by a herald: not used (*Shakspeare*).

HE'RALDRY. *s.* (*herauIderie*, French.) 1. The art or office of a herald (*Peacham*). 2. Registry of genealogies (*Denham*). 3. Blazonry (*Cleaveland*).

HERALDRY, the science which teaches how to blazon, or explain in proper terms, all that belongs to coats of arms; and how to marshal, or dispose regularly, divers arms on a field.

Arms, or coats of arms, are hereditary marks of honour, made up of fixed and determined colours and figures, granted by sovereign princes as a

reward for military valour, or some signal public service performed. These are intended to denote the descent and alliance of the bearer, or to distinguish states, cities, societies, &c. civil, ecclesiastical, and military.

Men in all ages have made use of figures of living creatures, or symbolical signs, to denote the bravery and courage either of their chief or nation, to render themselves the more terrible to their enemies, and even to distinguish themselves or families, as names do individuals. Thus the Egyptians bore an ox, the Athenians an owl, the Goths a bear, the Romans an eagle, the Franks a lion, and the Saxons a horse: the last is still borne in the arms of his present Britannic majesty. As to hereditary arms of families, William Camden, sir Henry Spelman, and other judicious heralds, agree, that they began no sooner than towards the latter end of the 11th century.

With tournaments first came up coats of arms; which were a sort of livery, made up of several lists, fillets, or narrow pieces of stuff of many colours, from whence came the fess, the bend, the pale, &c. which were the original charges of family-arms; for they who never had been at tournaments had not such marks of distinction. They who enlisted themselves in the croisades took up also several new figures hitherto unknown in armorial ensigns; such as alerions, bezants, escalop-shells, martlets, &c. but more particularly crosses of different colours for distinction's sake. From this it may be concluded, that heraldry, like most human inventions, was insensibly introduced and established; and that, after having been rude and unsettled for many ages, it was at last methodized, perfected, and fixed, by the croisades and tournaments.

These marks of honour are called arms, from their being principally and first worn by military men at war and tournaments, who had them engraved, embossed, or depicted on shields, targets, banners, or other martial instruments. They are also called coat of arms, from the custom of the ancients embroidering them on the coats they wore over their arms, as heralds do to this day.

Arms are distinguished by different names, to denote the causes of their bearing; such as arms of dominion; of pretension; of concession; of community; of patronage; of family; of alliance; of succession.

Arms of dominion, or sovereignty, are those which emperors, kings, and sovereign states do constantly bear; being annexed to the territories, kingdoms, and provinces, they possess. Thus the three lions are the arms of England, the harp those of Ireland, &c.

Arms of pretension are those of such kingdoms, provinces, or territories, to which a prince or lord has some claim, and which he adds to his own, although the said kingdoms or territories may be possessed by a foreign prince or lord. Thus the kings of England have quartered the arms of France with their own ever since Edward III. laid claim to the kingdom of France, which happened in the year 1330, on account of his being son to Isabella, sister to Charles the Handsome, who died without issue.

Arms of concession, or augmentation of honour, are either entire arms, or else one or more figures, given by princes as a reward for some extraordinary service. We read in history that Robert Bruce, king of Scotland, allowed the earl of Winton's ancestor to bear, in his coat-armour, a crown supported by a sword, to shew that he, and the clan Seaton, of which he was the head, supported his tottering crown.

Arms of community are those of bishoprics, cities, universities, academies, societies, companies, and other bodies corporate.

Arms of patronage are such as governors of provinces, lords of manors, patrons of benefices, &c. add to their family-arms, as a token of their superiority, rights, and jurisdiction. These arms have introduced into heraldry castles, gates, wheels, ploughs, rakes, harrows, &c.

Arms of family, or paternal arms, are those that belong to one particular family, that distinguish it from others, and which no person is suffered to assume without committing a crime, which sovereigns have a right to restrain and punish.

Arms of alliance are those which families or private persons take up and join to their own, to denote the alliances they have contracted by marriage. This sort of arms is either impaled, or borne in an escutcheon of pretence, by those who have married heiresses.

Arms of succession are such as are taken up by them who inherit certain estates, manors, &c. either by will, entail, or donation, and which they either impale or quarter with their own arms; which multiplies the titles of some families out of necessity, and not through ostentation, as many imagine.

These are the eight classes under which the different sorts of arms are generally ranged; but there is a sort which blazoners call assumptive arms, being such as are taken by the caprice or fancy of upstarts, though of ever so mean extraction, who, being advanced to a degree of fortune, assume them without a legal title.

The essential and integral parts of arms are these: 1. The escutcheon. 2. The tinctures. 3. The charges. 4. The ornaments.

Of the shield or escutcheon.—The shield or scutcheon is the field or ground whereon are represented the figures that make up a coat of arms: for these marks of distinction were put on bucklers or shields before they were placed on banners, standards, flags, and coat-armour; and wherever they may be fixed, they are still on a plane or superficies whose form resembles a shield.

Shields, in heraldry called escutcheons or scutcheons, from the Latin word *scutum*, have been, and still are, of different forms, according to different times and nations. Amongst ancient shields, some were almost like a horseshoe, such as is represented by a few of the figures of escutcheons: others triangular, somewhat flat or rounded at the bottom. The English, French, Germans, and other nations, have their escutcheons formed different ways, according to the carver's or painter's fancy: of these various examples are contained in the plates of heraldry. But the shield of maids, widows, and of such as are born ladies, and are married to private gentlemen, is of the form of a lozenge (See Plate 84.)

Armorists distinguish several parts or points in escutcheons, in order to determine exactly the position of the bearings they are charged with; they are here denoted by the first nine letters of the alphabet, ranged in the following manner (See Plate 84.)

The knowledge of these points is of great importance, and ought to be well observed, for they are frequently occupied with several things of different kinds. It is necessary to observe that the

dexter side of the escutcheon is opposite to the left hand, and the sinister side to the right hand of the person that looks on it.

Distinctions of houses.—These distinctions inform us how the bearer of each is descended from the same family; they also denote the subordinate degrees in each house from the original ancestors, viz.

First house. For the heir or first son the label; second son the crescent; third son the mullet; fourth son the martlet; fifth son the annulet; sixth son the fleur-de-lis.

Second house. The crescent, with the label on it, for the first son of the second son. The crescent on the crescent for the second son of the second son of the first house, &c. See Plate 84.

By the *tinctures* or colours is meant that variety of hue of arms common both to shields and their charges: the colours generally used are red, blue, sable, vert, purpure. Note, yellow and white, termed or and argent, are metals; these colours are represented in engravings by dots and lines, as in Plate 84.

Or is expressed by dots.

Argent is plain.

Gules, by perpendicular lines.

Azure, by horizontal lines.

Sable, by perpendicular and horizontal lines crossing each other.

Vert, by diagonal lines from the dexter chief to the sinister base point.

Purpure, by diagonal lines from the sinister chief to the dexter base point.

Furs.—There are different kinds, and represent the hairy skins of certain animals, prepared for the linings of robes of state; and anciently shields were covered with furred skins; they are used in coats of arms, viz.

Ermine, is black spots on a white field.

Ermines, is a field black with white spots.

Erminois, is a field gold with black spots.

Vair, is white and blue, represented by figures of small escutcheons arranged in a line, so that the base argent is opposite to the base azure.

Potent-counter-potent, is a field covered with figures like crutch heads. See Plate 84.

Charges, are whatsoever bearings or figures are borne in the field of a coat of arms.

Rampant, signifies the lion standing erect on one of the hind legs.

Rampant-gardant, is a lion standing on his hind leg, looking full-faced.

Rampant-regardant, standing upon his hinder leg, looking back towards his tail.

Passant: this term is to express the lion in a walking position.

Sejant, for the lion sitting, as the example.

Saliant, is when the lion is leaping or springing forward, as the example.

Couchant, is a lion lying at rest, with the head erect.

Passant-gardant, for a beast, when walking, with its head looking full-faced.

Couped, cut off smooth and even, as the example.

Erased, signifying torn or plucked off, as the example.

Demy, is the half of any charge, as the example, a demy lion.

Dormant, for sleeping with its head resting on its fore paws.

Partition lines, by which is understood a shield divided or cut through by a line or lines, either horizontal, perpendicular, diagonal, or transverse; the engraved examples are the crooked lines of partition, viz. engrailed, invecked, wavy, nebule, imbattled, raguly, indented, dancette, dove-tail. See Plate 84.

Roundels are round figures, much used in arms: the English heralds vary their names according to their colour, thus:

Or,	is termed a	Besant.
Argent,		Plate.
Gules,		Torteaux.
Azure,		Hurt.
Sable,		Pellet.
Vert,		Pomey.
Purpure,		Golpe.

Crescent, or half-moon, having its horns turned upwards.

Increscent, differs from the crescent, by having its horns turned to the dexter side.

Decrescent, is the reverse of the increscent, having its horns turned to the sinister side.

Rose, is represented, in heraldry, full blown, with fine green barbs, and seeded in the middle.

Annulet, or ring, and by some authors supposed to be rings of mail.

Chess-rook. This piece is used in the game of chess.

Star, in heraldry, is termed an estoile, having six waved points.

Trefoil, or three-leaved grass.

Quatrefoil, or four-leaved grass.

Cinquefoil, or five-leaved grass.

Mascle, is in shape like the lozenge, but is always perforated as the example.

Fountain, an heraldric term for a roundle barry wavy of six argents and azure.

Billet, a small parallelogram, supposed to be letters made up in the form of the example.

Rustre, is a lozenge pierced round in the middle.

Gutte, in heraldry, signifies drops of any thing liquid, and, according to their colour, are termed as follow: if

Or,	Gutte d'or.
Argent,	Gutte d'eau.
Vert,	Gutte de'olive.
Gules,	Gutte de sang.
Azure,	Gutte de larmes,
Sable,	Gutte poix.

Fess, an ordinary composed of two horizontal lines drawn across the centre of the shield.

Chevron, an ordinary, in form like two rafters of a house, or a pair of compasses extended.

Bend, an ordinary, drawn diagonally from the dexter chief to the sinister base, and takes up one-third of the field.

Pale, an ordinary, which is placed perpendicular in the centre of the shield.

Chief, an ordinary, which always occupies the upper part of the shield, and contains in depth the third of the field.

Cross, an ordinary, composed of four lines, four perpendicular, and two transverse.

Saltire, an ordinary, in form like the cross of St. Andrew.

Bend-sinister, which is placed diagonally from the sinister chief to the dexter base of the shield.

Quarter, an ordinary, formed of two lines, one perpendicular, the other horizontal, taking up one-fourth of the field, as the example.

Canton, an ordinary, in form like the quarter, but the size is only the third part of the chief.

Pile, an ordinary, like the foot of the pile that is driven into the ground to make the foundation of a building in swampy ground.

Flanches, are composed of two circular lines, and are always borne double, as the example.

Flory, a cross, the ends terminating in fleurs-de-lis.

Moline, a cross, which turns round both ways at the extremities, like a hook.

Pattee, a cross, small in the centre, and widening to the ends, which are very broad.

Croslet, a cross, crossed again at the extremities at a small distance from each of the ends.

Lozenge, a four-cornered figure, like a pane of glass in old casements, supposed to be a physical composition given for colds, and was invented to distinguish eminent physicians.

Mullet, consists of five points, and pierced in the centre, and is supposed to represent a spur rowel.

Mill-rind, a cross, in form like the mill-ink which carries the millstone, and is perforated in the centre.

Water-boujet, anciently used as a vessel by soldiers for carrying water in long marches.

Helmets, were formerly worn as a defensive weapon to cover the bearer's head : a helmet is now placed over a coat of arms as its chief ornament, and a mark of gentility. The

First is a side-faced helmet of steel, with the vizor ſhut, for an esquire.

Second is a full faced helmet of steel, with the vizor open, for knights or baronets.

Third is a side-faced helmet of steel, the bars and ornaments gold, for the dobility.

Fourth is a full faced helmet, with bars all gold, for the sovereign and princes of the blood royal.

Close, signifies the wings of a bird are down, and close to the body.

Rising. This term is for a bird when in a position as if preparing to fly.

Displayed, signifies the wings of an eagle to be expanded, as the example.

Volant, a term for any bird represented flying.

Tripping, a term for a stag, antelope, or hind, when walking.

Courant, for a stag, or horse, or greyhound, running.

At gaze, is a term for a stag or hind; when looking full-faced, is termed at gaze.

Lodged, signifies the stag to be at rest on the ground.

Inverted, is for two wings conjoined, and the points of the wings downwards.

Erect, is for two wings conjoined, and the points erect, or upwards.

Hauriant. This term is for a fish when erect, paleways, as putting its head above water.

Naiant, for a fish, when borne horizontally across the shield, as swimming.

Cockatrice, a chimerical figure used in heraldry; its beak, wings, legs, comb, wattles, and spurs, partake of the fowl; and its body and tail of the snake.

Wyvern. This, like the former, is chimerical, and differs from the cockatrice in its head having no comb, wattles, or ſpurs.

Dragon. This is an heraldic figure, as drawn by heralds. See the example.

Tiger. This, like the former, is of heraldic creation; being so different from the tiger of nature, it is termed the heraldic tiger.

Checky, is a shield or bearing, covered with small squares of different colours alternately.

Gyronny, is a shield divided into six or eight triangular parts of different colours, and the points all meeting in the centre of the shield.

Paly, is a shield divided into four, six, or more equal parts, by perpendicular lines, consisting of two colours.

Barry, is a shield divided into four, six, or more equal parts, by horizontal lines of two colours.

Bachelor.—The arms of a bachelor, whilst he remains such, he may quarter his paternal coat with other coats, if they belong to him, but he may not impale it till he is married.

Married man.—A married man is to conjoin the coat armours of himself and wife in one escutcheon paleways; the man's on the dexter side of the shield, and the woman's on the sinister side.

An heiress.—When an heiress is married, her arms are not be impaled with her husband's, but are to be borne on an escutcheon of pretence, placed in the centre of the shield.—Note, the escutcheon of pretence displays his pretension to her estate; and if the husband has issue by her, the heir of those two inheritors shall bear the hereditary coats of father and mother quarterly.

Quarterly.—Is an arms divided into four parts by a perpendicular and horizontal line crossing each other, in the centre of the shield, into four equal parts, termed quarters.

Maid.—The arms of a maid are to be placed in a lozenge; and if her father bore any difference in his coat the same is to be continued; for by the mark of cadency of her father's will be denoted what branch she is from.

Widow.—The arms of a widow are to be impaled with the arms of her late husband; her husband on the dexter side, and hers on the sinister side, upon a lozenge, as the example.

Knight of the garter and his lady.—When a knight of the garter is married, his wife's arms must be placed in a distinct shield, because his arms are surrounded with the ensign of that order; for though the husband may give his equal share of the shield and hereditary honour, yet he cannot share his temporary order of knighthood with her.

Commoner and his lady.—The arms of a commoner married to a lady of quality: he is not to impale her arms with his own; they are to be set aside of one another in separate shields, as the lady still retains her title and rank. See the example, pl. 84.

Of common charges borne in coats-of-arms.—It has been already observed, that in all ages men have made use of the representation of living creatures, and other symbolical signs, to distinguish themselves in war; and that these marks, which were promiscuously used for hieroglyphics, emblems, and personal devices, gave the first notion of heraldry. But nothing shows the extent of human fancy more, than the great variety of these marks of distinction, since they are composed of all sorts of figures, some natural, others artificial, and many chimerical; in allusion, it is to be supposed, to the state, quality, or inclination of the bearer.

Hence it is, that the sun, moon, stars, comets, meteors, &c. have been introduced to denote glory, grandeur, power, &c. Lions, leopards, tigers, serpents, stags, &c. have been employed to signify courage, strength, prudence, swiftness, &c.

The application to certain exercises, such as war, hunting, music, &c. has furnished lances, swords, pikes, arms, fiddles, &c. Architecture,

lumns, chevrons, &c.; and the other arts several things that relate to them.

Human bodies, or distinct parts of them, also clothes, and ornaments, have, for some particular intention, found place in armoury; trees, plants, fruits, and flowers, have likewise been admitted to denote the rarities, advantages, and singularities, of different countries.

The relation of some creatures, figures, &c. to particular names, has been likewise a very fruitful source of variety in arms. Thus the family of Coningsby bears three coneys; of Arundel, six swallows; of Urson, a bear; of Lucie, three pikes; in Latin *tres lucios pisces*; of Starkey, a stork; of Castleman, a castle triple-towered; of Shuttleworth, three weaver's shuttles, &c.

Besides these natural and artificial figures, there are chimerical or imaginary ones used in heraldry, the result of fancy and caprice; such as centaurs, hydras, phenixes, griffons, dragons, &c. Which great variety of figures shows the impossibility of comprehending all common charges in a work of this nature; therefore such only shall be treated of as are most frequently borne in coats-of-arms.

1. Among the multitude of natural figures which are used in coats-of-arms, those most usually borne are, for the sake of brevity as well as perspicuity, distributed into the following classes, viz. Celestial figures; as, the sun, moon, stars, &c. and their parts. Effigies of men, women, &c. and their parts. Beasts; as, lions, stags, foxes, boars, &c. and their parts. Birds; as, eagles, swans, storks, pelicans, &c. and their parts. Fishes; as, dolphins, whales, sturgeons, trouts, &c. and their parts. Reptiles and insects; as, tortoises, serpents, grasshoppers, &c. and their parts. Vegetables; as, trees, plants, flowers, herbs, &c. and their parts. Stones; as, diamonds, rubies, pebbles, rocks, &c.

These charges have, as well as ordinaries, divers attributes or epithets, which express their qualities, positions, and dispositions. Thus the sun is said to be *in his glory*, *eclipsed*, &c. The moon, *in her complement*, *increscent*, &c. Animals are said to be *rampant*, *passant*, &c. Birds have also their denominations, such as *close*, *displayed*, &c. Fishes are described to be *hauriant*, *naiant*, &c. It is only therefore necessary to notice here, that lions are termed *lioncels* if more than two in the field, and eagles *eaglets*.

It must be observed also, that trees and plants are sometimes said to be trunked, eradicated, fructuated or raguled, according as they are represented in arms.

2. Of artificial figures borne in coats-of-arms, the following classes may be distinguished. Warlike instruments; as, swords, arrows, battering-rams, gauntlets, helmets, spears, pole-axes, &c. Ornaments used in royal and religious ceremonies; as, crowns, coronets, mitres, wreaths, crosiers, &c. Architecture; as, towers, castles, arches, columns, plummets, battlements, churches, portcullisses, &c. Navigation; as, ships, anchors, rudders, pendants, sails, oars, masts, flags, galleys, lighters, &c.

All these bearings have different epithets, serving either to express their position, disposition, or make: viz. swords are said to be erect, pommeled, hilted, &c.; arrows, armed, feathered, &c.; towers, covered, embattled, &c.; and so on of all others.

3. Chimerical figures form the last and oddest kind of bearings in coats of arms, as under the name of chimerical heralds rank all figures of things which have no real existence, but are mere fabulous and fantastical inventions. These charges, griffons, martlets, and unicorns excepted, are so uncommon in British coats, that we have not thought it necessary to give examples of them. Instances occur, however, of angels, cherubims, tritons, centaurs, martlets, griffons, unicorns, dragons, mermaids, satyrs, wiverns, harpies, cockatrices, phenixes, &c. and all these, like the foregoing charges, are subject to various positions and dispositions, which, from the principles already laid down, will be plainly understood.

To the forementioned figures may be added the montegre, an imaginary creature, supposed to have the body of a tiger with a satyr's head and horns; also those which have a real existence, but are said to be endowed with extravagant and imaginary qualities, viz. the salamander, beaver, camelion, &c.

It is an established rule among the heralds, that in blazoning, animals are always to be interpreted in the best sense; that is, according to their most noble and generous qualities, and so as may redound most to the honour of the bearers.

Thus the fox, being repeated witty, and withal given to fiching for his prey; if this be the charge of an escutcheon, we are to conceive the quality represented to be his wit and cunning, not his theft.

Guillim adds, that all savage beasts are to be figured in their fiercest action; as, a lion erected, his mouth wide open, his claws extended, &c. thus formed, he is said to be rampant. A leopard or wolf is to be pourtrayed going, as it were, pedetentim; which form of action, saith Chassanæus, fits their natural disposition, and is termed passant. The gentler kinds are to be set forth in their noblest and most advantageous action; as, a horse running or vaulting, a grey-hound coursing, a deer tripping, a lamb going with smooth and easy pace, &c.

Every animal is to be moving or looking to the right side of the shield; and it is a general rule, that the right foot be placed foremost, because the right side is reckoned the beginning of motion: add, that the upper part is nobler than the lower; so that things constrained either to look up or down, ought rather to be designed looking upwards. It must be noted, that notwithstanding these solemn precepts of Guillim, and the other masters of armoury, we find by experience that there are lions passant, couchant, and dormant, as well as rampant, and that most animals in arms look down, and not up.

Birds are esteemed a more honourable bearing than fish; and wild and ravenous birds than tame ones.

Of the external ornaments of escutcheons.—The ornaments that accompany or surround escutcheons denote the birth, dignity, or office, of the person to whom the coat of arms appertaineth; and obtains both among the laity and clergy. The chief of which are as follow:

Crowns.—The first crowns were only diadems, bands, or fillets; afterwards they were composed of branches of divers trees, and then flowers were added to them. Among the Greeks, the crowns given to those who carried the prize at the Isthmian games were of pine; at the Olympic of laurel; and at the Nemean of smallage. The Romans had various crowns to reward martial ex-

ploits and extraordinary services done to the republic. Examples of some of these crowns are frequently met with in modern achievements.

Modern crowns are only used as an ornament, which emperors, kings, and independent princes set on their heads, in great solemnities, to denote their sovereign authority. These are described in heraldry as follow:

The imperial crown is made of a circle of gold, adorned with precious stones and pearls, heightened with fleurs-de-lis, bordered and seeded with pearls, raised in the form of a cap voided at the top, like a crescent. From the middle of this cap rises an arched fillet enriched with pearls, and surmounted of a mound, whereon is a cross of pearls. See Plate 85.

The crown of the kings of Great Britain is a circle of gold, bordered with ermine, enriched with pearls and precious stones, and heightened up with four crosses pattee, and four large fleurs-de-lis alternately; from these rise four arched diadems adorned with pearls, which close under a mound, surmounted of a cross like those at bottom.

The crowns of Spain and Portugal are a ducal coronet, heightened up with eight arched diadems that support a mound, ensigned with a plain cross. Those of Denmark and Sweden are both of the same form; and consist of eight arched diadems, rising from a marquis's coronet, which conjoin at the top under a mound ensigned with a cross botone. The crowns of most other kings in Europe are circles of gold, adorned with precious stones, and heightened up with large trefoils, and closed by four, six, or eight diadems, supporting a mound, surmounted of a cross.

The great Turk bears over his arms a turban, enriched with pearls and diamonds, under two coronets, the first of which is made of pyramidical points heightened up with large pearls, and the uppermost is surmounted with crescents.

The pope appropriates to himself a tiara or long cap of golden cloth, from which hang two pendants embroidered and fringed at the ends, semée of crosses of gold. This cap is inclosed by three marquis's coronets; and has on its top a mound of gold, whereon is a cross of the same, which cross is sometimes represented by engravers and painters pometted, recrossed, flowery, or plain. It is a difficult matter to ascertain the time when these haughty prelates assumed the three forementioned coronets. See Plate 84.

Coronets.—The coronet of the prince of Wales, or eldest son of the king of Great Britain, was anciently a circle of gold set round with four crosses-pattee, and as many fleurs-de-lis alternately; but since the Restoration it has been closed with one arch only, adorned with pearls, and surmounted of a mound and cross, and bordered with ermine like the king's. But besides the coronet his royal highness has another distinguishing mark of honour, peculiar to himself, viz. a plume of three ostrich feathers, with an ancient coronet of a prince of Wales. Under it, in a scroll, is this motto, *Ich dien*, which in the German or old Saxon language signifies "I serve." This device was at first taken by Edward prince of Wales, commonly called the black prince, after the famous battle of Cressy, in 1346, where having with his own hand killed John, king of Bohemia, he took from his head such a plume, and put it on his own. See Plate 85.

The coronet of all the immediate sons and brothers of the kings of Great Britain is a circle of gold, bordered with ermine, heightened up with four fleurs-de-lis, and as many crosses-pattee alternate. The particular and distinguishing form of such coronets as are appropriated to princes of the blood royal is described and settled in a grant of Charles II. in the 13th of his reign. See Plate 84.

The coronet of the princesses of Great Britain is a circle of gold, bordered with ermine, and heightened up with crosses-pattee, fleurs-de-lis, and strawberry leaves alternate; whereas a prince's coronet has only fleurs-de-lis and crosses.

A duke's coronet is a circle of gold bordered with ermine, enriched with precious stones and pearls, and set round with eight large strawberry or parsley leaves. See Plate 84.

A marquis's coronet is a circle of gold, bordered with ermine, set round with four strawberry leaves and as many pearls on pyramidical points of equal height, alternate. See Plate 84.

An earl's coronet is a circle of gold, bordered with ermine, heightened up with eight pyramidical points or rays, on the tops of which are as many large pearls, that are placed alternately with as many strawberry leaves, but the pearls much higher than the leaves. See Plate 84.

A viscount's coronet differs from the preceding ones as being only a circle of gold bordered with ermine, with large pearls set close together on the rim, without any limited number, which is his prerogative above the baron, who is limited. See Plate 84.

A baron's coronet, which it appears was granted by king Charles II., is formed with six pearls set at equal distances on a gold circle, bordered with ermine, four of which only are seen on engravings, paintings, &c. to shew he is inferior to the viscount. See Plate 84.

The eldest sons of peers, above the degree of a baron, bear their father's arms and supporters with a label, and use the coronet appertaining to their father's second title; and all the younger sons bear their arms with proper differences, but use no coronets.

As the crown of the king of Great Britain is not quite like that of other potentates, so do most of the coronets of foreign noblemen differ a little from those of the British nobility.

Mitres.—The archbishops and bishops of England and Ireland place a mitre over their coat of arms. It is a round cap pointed and cleft at the top, from which hang two pendants fringed at both ends; with this difference, that the bishop's mitre is only surrounded with a fillet of gold, set with precious stones, whereas the archbishop's issues out of a ducal coronet. See Plate 84.

This ornament, with other ecclesiastical garments, is still worn by all the archbishops and bishops of the church of Rome, whenever they officiate with solemnity; but it is never used in England otherwise than on coats of arms, as before mentioned.

The first archbishop's consecration in England was in the year 568. No mitre but an archbishop's is borne upon a ducal coronet, except the bishop of Durham, that see being a principality.

The first bishop's consecration in England was in the year 516.

Chapeaux, wreaths, and crests.—A chapeau is an ancient hat, or rather cap, of dignity, worn by dukes, generally scarlet-coloured velvet on the outside, lined and turned up with fur; frequently to be met with above an helmet, instead of a wreath, under gentlemen's and noblemen's crests

[H]eretofore they were seldom to be found, as of [r]ight appertaining to primate families; but by the [g]rants of Robert Cooke, Clarencieux, and other [s]ucceeding heralds, these, together with ducal coronets, are now frequently to be met with in families, who yet claim not above the degree of gentlemen. See Plate 85.

The wreath is a kind of roll made of two skains of silk of different colours twisted together, which ancient knights wore as a head-dress when equipped for tournaments. The colours of the silk are always taken from the principal metal and colour contained in the coat of arms of the bearer. They are still accounted as one of the lesser ornaments of escutcheons, and are placed between the helmet and the crest (see Plate 85). In the time of Henry I. and long after, no man who was under the degree of a knight had his crest set on a wreath; but this, like other prerogatives, has been infringed so far that every body now-a-days wears a wreath.

The crest is the highest part of the ornaments of a coat of arms. It is called crest from the Latin word *crista*, which signifies comb or tuft, such as many birds have upon their heads, as the peacock, pheasant, &c. in allusion to the place on which it is fixed. See Plate 85, crest of the prince of Wales.

Crests were formerly great marks of honour, because they were only worn by heroes of great valour, or by such as were advanced to some superior military command, in order that they might be the better distinguished in an engagement, and thereby rally their men if dispersed; but they are at present considered as a mere ornament. The crest is frequently a part either of the supporters, or of the charge borne in the escutcheon. Thus the crest of the royal achievement of Great Britain is a "lion guardant crowned." There are several instances of crests that are relative to alliances, employments, or names; and which on that account have been changed. See Crest.

The scroll and supporters.—The scroll is the ornament usually placed below the crest, containing a motto, or short sentence, alluding thereto, or to the bearings, or to the bearer's name, as in the two following instances. The motto of the noble earl of Cholmondeley is, "Cassis tutissima virtus;" i. e. "Virtue is the safest helmet;" on account of the helmet in the coat of arms. The motto of the right hon. lord Fortescue is, "Forte scutum salus ducum;" i. e. "A strong shield is the safety of the commanders;" alluding to the name of that ancient family. Sometimes it has reference to neither, but expresses something divine or heroic; as that of the earl of Scarborough, which is, "Murus æreus conscientia sana;" i. e. "A good conscience is a wall of brass." Others are enigmatical; as that of the royal achievement, which is, "Dieu et mon droit;" i. e. "God and my right;" introduced by Edward III. in 1340, when he assumed the arms and title of king of France, and began to prosecute his claim, which occasioned long and bloody wars, fatal, by turns, to both kingdoms. Mottos, though hereditary in the families that first took them up, have been changed on some particular occasions, and others appropriated in their stead, instances of which are sometimes met with in the history of families.

Supporters are figures standing on a scroll, and placed at the side of the escutcheon; they are so called because they seem to support or hold up the shield. Supporters have formerly been taken from such animals or birds as are borne in the shields, and sometimes they have been chosen as bearing some allusion to the names of those whose arms they are made to support. The supporters of the arms of Great Britain, since king James the First's accession to the throne, are, a lion rampant guardant crowned or, on the dexter side, and an unicorn argent, crowned, armed, unguled, maned and gorged with an antique crown, to which a chain is affixed, all or, on the sinister.

It is to be observed, that bearing coats of arms supported, is, according to the heraldic rules of England, the prerogative, 1st, Of those called nobiles majores, viz. dukes, marquisses, earls, viscounts, barons: 2d, Of all knights of the garter, though they should be under the degree of barons: 3d. Of knights of the Bath, who both receive on their creation a grant of supporters; and, lastly, of such knights as the king chooses to bestow this honour upon.

Of the laws of heraldry, and the method of marshalling coats of arms.—1. The first and most general rule is, to express heraldic distinctions in proper terms, so as not to omit any thing that ought to be specified, and at the same time to be clear and concise without tautology. 2. Begin with the tincture of the field, and then proceed to the principal charges which possess the most honourable place in the shield, such as fess, chevron, &c. always naming that charge first which lies next and immediately upon the field. 3. After naming the tincture of the field, the honourable ordinaries, or other principal figures, you must specify their attributes, and afterwards their metal or colour. 4. When an honourable ordinary, or some one figure, is placed upon another, whether it be a fess, cheveron, cross, &c. it is always to be named after the ordinary or figure over which it is placed, with one of these expressions, surtout, or over all. 5. In the blazoning of such ordinaries as are plain, the bare mention of them is sufficient; but if an ordinary should be made of any of the crooked lines mentioned above, its form must be specified; that is, whether it be engrailed, wavy, &c. 6. When a principal figure possesses the centre of the field, its position is not to be expressed, or (which amounts to the same thing) when a bearing is named, without specifying the point where it is placed, then it is understood to possess the middle of the shield. 7. The number of the points of mullets or stars must be specified when more than five; and also if a mullet or any other charge be pierced, it must be mentioned as such, to distinguish it from what is plain. 8. When a ray of the sun, or other single figure, is borne in any other part of the escutcheon than the centre, the point it issues from must be named. 9. The natural colour of trees, plants, fruits, birds, &c. is no otherwise to be expressed in blazoning but by the word proper; but if discoloured, that is, if they differ from their natural colour, it must be particularised. 10. When three figures are in a field, and their position is not mentioned in the blazoning, they are always understood to be placed two above and one below. 11. When there are many figures of the same species borne in a coat of arms, their number must be observed as they stand, and must be distinctly expressed.

By marshalling coats of arms is to be understood the art of disposing divers of them in one

escutcheon, and of distributing their contingent ornaments in proper places. Various causes may occasion arms to be thus conjoined, which are comprised under two heads, viz. manifest and obscure. What is meant by manifest causes in the marshalling of coats of arms, are such as betoken marriages, or a sovereign's gift, granted either through the special favour of the prince, or for some eminent services. Concerning marriages it is to be observed,

1. When the coats of arms of a married couple, descended of distinct families, are to be put together in one escutcheon, the field of their respective arms is conjoined paleways, and blazoned parted per pale, baron and femme, two coats; first, &c. In which case the baron's arms are always to be placed on the dexter side, and the femme's arms on the sinister side.

2. If a widower marry again, his late and present wife's arms are "to be placed on the sinister side, in the escutcheon with his own, and parted per pale. The first wife's coat shall stand on the chief, and the second on the base; or he may set them both in pale with his own, the first wife's coat next to himself, and his second outermost. If he should marry a third wife, then the two first matches shall stand on the chief, and the third shall have the whole base. And if he take a fourth wife, she must participate one-half of the base with the third wife, and so will they seem to be so many coats quartered." But it must be observed, that these forms of impaling are meant of hereditary coats, whereby the husband stands in expectation of having the hereditary possessions of his wife united to his patrimony.—Note. If a man marry a widow, he marshals her maiden arms only.

3. In the arms of femmes joined to the paternal coat of the baron, the proper differences by which they were borne by the fathers of such women must be inserted.

4. If a coat of arms that has a bordure be impaled with another, as by marriage, then the bordure must be wholly omitted in the side of the arms next the centre.

5. The person that marries an heiress, instead of impaling his arms with those of his wife, is to bear them in an escutcheon placed in the centre of his shield, which, on account of its showing forth his pretension to her estate, is called an escutcheon of pretence, and is blazoned surtout, that is, over all. But the children are to bear the hereditary coat of arms of their father and mother quarterly, which denotes a fixed inheritance, and so transmit them to posterity. The first and fourth quarters generally contain the father's arms, and the second and third the mother's; except the heirs should derive not only their estate but also their title and dignity from their mother.

6. If a maiden or dowager lady of quality marry a commoner, or a nobleman inferior to her in rank, their coats of arms may be set beside one another, in two separate escutcheons, upon one mantle or drapery, and the lady's arms ornamented according to her title. See Plate 84.

7. Archbishops and bishops impale their arms differently from the fore-mentioned coats, in giving the place of honour, that is, the dexter side, to the arms of their dignity, as it is expressed in Plate 84, which represents the coat of arms of a supposed archbishop of Canterbury and bishop of an English see.

With respect to such armorial ensigns as the sovereign thinks fit to augment a coat of arms with, they may be marshalled in various ways, as may be seen in the arms of his grace the duke of Rutland, and many others.

So far the causes for marshalling divers arms in one shield, &c. are manifest. As to such as are called obscure, that is, when coats of arms are marshalled in such a manner that no probable reason can be given why they are so conjoined, the explanation of them must be left to the heralds.

Of the orders of knighthood, &c.—The baronet's mark of distinction, or the arms of the province of Ulster in Ireland, granted and made hereditary in the male line by king James I. who erected this dignity on the 22d of May, 1611, in the 9th year of his reign, in order to propagate a plantation in the fore-mentioned province. This mark is argent, a sinister hand couped at the wrist, and erected gules; which may be borne either in a canton, or in an escutcheon, as will best suit the figures of the arms. The ancient and respectable badge of the most noble order of the garter was instituted by king Edward III. 1349, in the 27th year of his reign. This honourable augmentation is a deep blue garter, surrounding the arms of such knights, and inscribed with this motto, "Honi soit qui mal y pense."

The arms of those who are knights of the orders of the Bath, of the Thistle, or of St. Patrick, are marshalled in the same manner, with this difference only, that the colour and motto accord with the order to which it belongs. Thus the motto, "Quis separabit 1783" on the light blue ribbon of the order, surrounds the escutcheon of a knight of St. Patrick. "Nemo me impune lacessit," on a green riband, distinguishes a knight of the Thistle; and "Tria juncta in uno," on red, a knight of the Bath. It is to be observed, that none of the orders of knighthood are hereditary. The honours of a baronet of Ulster, and of a baronet of Nova Scotia (created by patent in 1602), descend to the heirs-male.

For representations of the badges of the several orders of knighthood, see Plate 85.

Of funeral escutcheons.—After having treated of the essential parts of coats-of-arms, of the various charges and ornaments usually borne therewith, of their attributes and dispositions, and of the rules for blazoning and marshalling them, we shall next describe the several funeral escutcheons, usually called hatchments; whereby may be known, after any person's decease, what rank either he or she held when living; and if it be a gentleman's hatchment, whether he was a bachelor, married man, or widower, with the like distinctions for gentlewomen.

The hatchment is usually affixed to the fronts of houses, when any of the nobility or gentry die. The arms, if the deceased be a private gentleman, are parted per pale with those of his wife. The ground without the escutcheon being black, denotes the man to be dead; and the ground on the sinister side being white, signifies that the wife is living, which is distinctly shown in Plate 85, where also all the varieties of hatchments are displayed, according to the following descriptions.

When a married gentlewoman dies first, the hatchment is distinguished by a contrary colour from the former; that is, the arms on the sinister side have the ground without the escutcheon black; whereas those on the dexter side, for her sur

husband, are upon a white ground: the hatchment of a gentlewoman is, moreover, differenced by a cherub over the arms instead of a crest.

When a bachelor dies, his arms may be depicted single or quartered, with a crest over them, but never impaled as the two first are, and all the ground without the escutcheon is also black.

When a maid dies, her arms, which are placed in a lozenge, may be single, or quartered, as those of a bachelor: all the ground without the escutcheon is also black.

When a widower dies, his arms are represented impaled with those of his deceased wife, having a crest, and sometimes a helmet and mantling over them, and all the ground without the escutcheon black.

When a widow dies, her arms are also represented impaled with those of her deceased husband, but inclosed in a lozenge, and a cherub is placed over them; all the ground without the escutcheon is also black.

If a widower or bachelor should happen to be the last of his family, a death-head is generally annexed to each hatchment, to denote that death has conquered all.

By the fore-mentioned rules, which are sometimes neglected through the ignorance of illiterate people, may be known, upon the sight of any hatchment, what branch of the family is dead; and by the helmet, coronet, &c. what title and degree the deceased person held. The same rules are observed with respect to the escutcheons placed on the hearse and horses used in pompous funerals, except that they are not surmounted with any crest, as in the foregoing examples of hatchments, but are always plain. It is necessary, however, to ensign those of peers with coronets, supporters, &c. and that of a maiden lady with a knot of ribands. For various other examples of hatchments already referred to, see Plate 85.

Of precedency.—In forming the present treatise, we can by no means omit giving some account of the laws which govern the precedency of the different ranks which compose the community of Great Britain.

SECT. I. *Of the precedency of men.*

The first personage in point of precedency, is of course—

The King.
Prince of Wales.
King's sons.
King's brothers.
King's uncles.
King's grandsons.
King's nephews.
Vicegerent, when any such officer.
Archbishop of Canterbury, lord primate of all England.
Lord high chancellor, or lord keeper.
Archbishop of York, primate of England.
Lord high treasurer.
Lord president of the privy council.
Lord privy seal.
Lord high constable in commission.
Hereditary earl marshal.
Lord high admiral.
Lord steward of his majesty's household.
Lord chamberlain of his majesty's household.
Dukes, according to patents of creation.
Marquisses, according to their patents.
Dukes' eldest sons.
Earls, according to their patents.
Marquisses' eldest sons.
Dukes' younger sons.
Viscounts, according to their patents.
Earls' eldest sons.
Marquisses' younger sons.
Bishops of London, Durham, Winchester.
Bishops, according to seniority of consecration; but if any bishop be principal secretary of state, he shall be placed above all other bishops, not having any of the great offices before mentioned.
Barons, according to their patents of creation; but if any baron be principal secretary of state, he shall be placed above all barons, unless they have any of the great offices before mentioned.
Speaker of the house of commons.
Viscounts' eldest sons.
Earls' younger sons.
Barons' eldest sons.
Knights of the most noble order of the garter.
Privy councillors.
Chancellor of the exchequer.
Chancellor of the duchy of Lancaster.
Lord chief justice of the king's bench.
Master of the Rolls.
Lord chief justice of the common pleas.
Lord chief baron of the exchequer.
Judges, barons, of the degree of the coif of the said courts, according to seniority.
Bannerets, made under the king's own royal standard, displayed in an army royal, in open war, by the king himself in person, for the term of their lives only.
Viscounts' younger sons.
Barons' younger sons.
Baronets.
Bannerets, not made by the king in person.
Knights of the most honourable order of the Bath.
Knights bachelors.
Baronets' eldest sons.
Knights' of the garter eldest sons.
Bannerets' eldest sons.
Knights' of the Bath eldest sons.
Knights' eldest sons.
Sergeants at law, DD. LLD. MD. of British universities.
Baronets' younger sons.
Esquires of the king's creation, by the imposition of a collar of SS.
Esquires attending knights of the Bath.
Esquires by office, as justices of the peace.
Captains, gentlemen of the privy chamber, &c.
Knights' of the garter younger sons.
Bannerets' of both kinds younger sons.
Knights' of the Bath younger sons.
Knights bachelors' younger sons.
Gentlemen entitled to bear arms.
Gentlemen, by office, function, or profession,
Clergymen.
Attorneys at law, &c.
Citizens.
Burgesses, &c.

SECT. II. *Precedency of women.*

The Queen.
Princess of Wales.
Princess Royal.
Daughters of the king.
Duchess of York, and
Wives of the king's younger sons.
Wives of the king's brothers.
Wives of the king's uncles.
Wives of the eldest sons of dukes, of the blood royal.

Daughters of dukes, of the blood royal.
Wives of the king's brothers' or sisters' sons.
Duchesses.
Marchionesses.
Wives of the eldest sons of dukes.
Daughters of dukes.
Countesses.
Wives of the eldest sons of marquisses.
Daughters of marquisses.
Wives of the younger sons of dukes.
Viscountesses.
Wives of the eldest sons of earls.
Daughters of earls.
Wives of the younger sons of marquisses.
Baronesses.
Wives of the eldest sons of viscounts.
Daughters of viscounts.
Wives of the younger sons of earls.
Wives of the eldest sons of barons.
Daughters of barons.
Wives of the younger sons of viscounts.
Wives of the younger sons of barons.
Dames, wives of baronets.
Wives of knights of the garter.
Wives of bannerets of each kind.
Wives of knights of the Bath.
Wives of knights bachelors.
Wives of the eldest sons of baronets.
Daughters of baronets.
Wives of the eldest sons of knights of the garter.
Daughters of knights of the garter.
Wives of the eldest sons of bannerets of each kind.
Daughters of bannerets of each kind.
Wives of the eldest sons of knights of the Bath.
Daughters of knights of the Bath.
Wives of the eldest sons of knights bachelors.
Wives of serjeants at law, DD. LLD. MD. of British universities.
Wives of the younger sons of baronets.
Daughters of knights bachelors.
Wives of esquires, attendants on knights of the Bath.
Wives of esquires by office, as justices of the peace.
Wives of captains, gentlemen of the privy chamber, &c.
Wives of the younger sons of knights of the garter.
Wives of the younger sons of bannerets of each kind.
Wives of the younger sons of knights of the Bath.
Wives of the younger sons of knights bachelors.
Wives of gentlemen lawfully bearing coat armour.
Daughters of esquires lawfully bearing coat armour, who are gentlewomen by birth.
Daughters of gentlemen lawfully bearing coat armour, who are gentlewomen by birth.
Wives of gentlemen by office, function, or profession, as clergymen, and attorneys at law, &c. &c.
Wives of citizens.
Wives of burgesses, &c.

HERAT, a town of Persia, in Chorasan: in its neighbourhood roses are so plentiful, that it is called Surgultzar, or the city of roses. Lat. 34. 30 N. Lon. 61. 50 E.

HERAULT, a department of France, so called from a river which falls into the gulf of Lyons. It includes part of the late province of Languedoc; and the capital is Montpellier.

HERB. Herba. In common language a herb is used in opposition to a tree. By Linnéus the herb is put for that part of a vegetable which arises from the root, is terminated by the fructification, and comprehends the stem, leaves, fulcres, and hybernacle. Vegetabilis pars, orta a radice, terminata fructificatione, comprehenditque truncum, folia, fulcra, hybernaculum. Philos. Bot. Herba adscendens aëria spirans, movens. Regn. Veg.

Herbaceous plants, are such as perish annually down to the root.

Herbaceous stem, perishing annually, soft not woody.

HERBS constitute the fourth nation, great tribe or cast, into which Linnéus divides all vegetables. See GENTES.

HERB BENNET, in botany. See GEUM.

HERB CHRISTOPHER, in botany. See ACTÆA.

HERB OF GRACE, in botany. See RUTA.

HERB MASTIC, in botany. See SATUREIA.

HERB TWOPENCE, in botany. See LYSIMACHIA.

HERB WILLOW, in botany. See EPILOBIUM, LYTHRUM and LYSIMACHIA.

HERBA'CEOUS. *a.* (from *herba*, Latin.) 1. Belonging to herbs (*Brown*). 2. Feeding on vegetables (*Derham*).

HE'RBAGE. *s.* (*herbage*, French.) 1. Herbs collectively; grass; pasture (*Woodw.*). 2. The tithe and the right of pasture (*Ains.*)

HE'RBAL. *s.* (from *herb.*) A book containing the names and descriptions of plants (*Bacon*).

HE'RBALIST. *s.* (from *herbal.*) A man skilled in herbs (*Brown*).

HE'RBARIST. *s.* (*herbarius*, Lat.) One skilled in herbs (*Boyle*).

HE'RBELET. *s.* (diminutive of *herb.*) A small herb (*Shakspeare*).

HERBELOT (Bartholomew d'), a learned orientalist, was born in France in 1625. He applied himself with great diligence to the Hebrew and other eastern languages, and in which he acquired such eminence as to obtain a large pension in his own country, and honours from abroad. His great work, entitled Bibliothêque Orientale, or Universal Dictionary, containing whatever relates to the knowledge of the eastern world, is universally known. He died in 1695.

HERBER, among farriers, a stimulative application to excite a discharge, in certain diseases of horses, and especially of the head. It usually consists of a piece of hellebore root introduced under the skin, which, of course, acts as a rowel or seton.

HERBERT (Mary), countess of Pembroke, was the sister of sir Philip Sidney, who dedicated to her his Arcadia. She translated from the French a tragedy called Antonius, 1595, 12mo. and rendered into English some of David's psalms. She died in 1621. Ben Jonson wrote her epitaph as follows:

Underneath this sable herse
Lies the subject of all verse;

Sidney's sister, Pembroke's mother;
Death! ere thou hast kill'd another,
Fair and good and learn'd as she,
Time shall throw a dart at thee.

Herbert (Edward), lord Herbert of Cherbury in Shropshire, was born in Montgomery castle in 1581. He received his education at Oxford, after which he went on his travels, and became an accomplished gentleman. On his return he was made one of the king's counsellors for military affairs, and soon after was sent ambassador to France to intercede in behalf of the persecuted protestants, where he behaved with great dignity and spirit. In 1625 he was made a peer of the kingdom of Ireland, and in 1631 created an English peer. At the breaking out of the rebellion he sided with the parliament. He died in 1648. Lord Herbert wrote some singular books, the most remarkable of which is that entitled, De Veritate, &c. Its design is to shew the absolute sufficiency of natural reason for all religious purposes; on which account the author has been ranked, and justly, among the deists. He also wrote the history of the Life and Reign of Henry VIII. and a treatise in Latin on the ancient religion of the Gentiles.

Herbert (George), an English poet and divine, was brother of the above, and born in 1593. He received his education at Westminster school, from whence he was elected to Trinity-college, Cambridge, where he took his degrees in arts, and was chosen fellow. He was also appointed orator to the university, which office he held eight years. Being disappointed in his views of preferment in the state, he entered into orders, and obtained the rectory of Bemerton near Salisbury, and a prebend in the church of Lincoln. He was a most exemplary divine, and died about 1635. His poems, entitled, The Temple, were printed in 1635, 12mo. and his Priest to the Temple in 1652. They have been frequently reprinted.

Herbert (Thomas), an ingenious writer of the Pembroke family, was born at York. He was entered first of Jesus college, Oxford, from whence he removed to Trinity-college, Cambridge, after which he went on his travels, in which he spent four years. In 1634 he published, in folio, a relation of some years' travels into Africa and the Great Asia, especially the territories of the Persian monarchy, and some parts of the oriental Indies and isles adjacent. On the breaking out of the rebellion he joined the parliament party, and was very active in that cause. When the king was under the necessity of dismissing his servants, he chose him to be one of the grooms of his bed-chamber, and Mr. Herbert continued to serve him with great fidelity and affection to the last. For this he was created a baronet by Charles II. at the restoration. He died in 1682. Sir Thomas wrote, besides his travels, a curious book, entitled, Threnodia Carolina, containing an historical account of the two last years of the life of king Charles I. 8vo.

HERBESCENT. *a.* (*herbescens*, Lat.) Growing into herbs.

HE'RBID. *a.* (*herbidus*, Latin.) Covered with herbs.

HERBIVOROUS ANIMALS, are those which feed only on vegetables.

HE'RBORN, a town of Germany, in the circle of Westphalia, and principality of Nassau Dillenburg. Lat. 50.34 N. Lon. 8.20 E.

HE'RBOROUGH. *s.* (*herberg*, German.) Place of temporary residence (*Ben Jonson*).

HE'RBOUS. *a.* (*herbosus*, Latin.) Abounding with herbs.

HE'RBULENT. *a.* (from *herbula*, Latin.) Containing herbs.

HERBWOMAN. *s.* (*herb* and *woman*.) A woman that sells herbs (*Arbuthnot*).

HE'RBY. *a.* (from *herb*.) Having the nature of herbs (*Bacon*).

HERCULANEUM, a town of Campania swallowed up by an earthquake, produced from an eruption of mount Vesuvius, A. D. 79, in the reign of Titus. This famous city was discovered in the beginning of the last century, and from the ruins have been dug busts, statues, manuscripts, paintings, and utensils, which contribute much to enlarge our notions concerning the ancients. A more valuable acquisition than bronzes and pictures was thought to be made, when a large parcel of manuscripts was found among the ruins. Hopes were entertained that many works of the classics, which time has deprived us of, were now going to be restored to light, and that a new mine of science was on the point of being opened. But the difficulty of unrolling the burnt parchment, of pasting the fragments on a flat surface, and of decyphering the obscure letters, have proved such obstacles, that very little progress has been made in the work. A priest invented the method of proceeding; but it would require the joint labours of many learned to carry on so nice and tedious an operation with any success. Indeed, much was expected when the prince of Wales engaged so munificently in the employment of persons to examine these MSS.: but hitherto their labour has been almost entirely in vain, and the rolls remain at Carleton-house, without having furnished any important information or scarcely any gratification to those who have been employed.

HERCULES, a name given to several persons in ancient and fabulous history. Of all these the son of Jupiter and Alcmena is the most celebrated, and to him the actions of the others have been generally attributed. The birth of Hercules was attended with many miraculous events: it is reported that Jupiter, who introduced himself to the bed of Alcmena, was employed three nights in forming a child whom he intended to be the greatest hero the world ever beheld. He was brought up at Tirynthus, or at Thebes, and before he had completed his eighth month, the jealousy of Juno, intent upon his destruction, sent two snakes to devour him. Not terrified at the sight of the serpents, he boldly seized them

and squeezed them to death, while his brother Iphiclus alarmed the house with his frightful shrieks. He was early instructed in the liberal arts, and soon became the pupil of the centaur Chiron, under whom he rendered himself the most valiant and accomplished of the age. In the 18th year of his age he commenced his arduous and glorious pursuits. He subdued a huge lion that devoured the flocks of his supposed father Amphitryon. After he had destroyed the lion, he delivered his country from the annual tribute of an hundred oxen which it paid to Erginus. As Hercules by the will of Jupiter was subjected to the power of Eurystheus, and obliged to obey him in every respect, Eurystheus, jealous of his power, ordered him to appear at Mycenæ and perform the labours, which, by priority of birth, he was empowered to impose upon him. Hercules refused, but afterwards consulted the oracle of Apollo, and was told that he must be subservient for twelve years to the will of Eurystheus, in compliance with the commands of Jupiter; and that after he had achieved the most celebrated labours, he should be reckoned in the number of the gods. So plain an answer determined him to go to Mycenæ, and to bear with fortitude whatever gods or men imposed upon him. Eurystheus, apprehensive of so powerful an enemy, commanded him to achieve a number of enterprizes the most difficult and arduous ever known, generally called the 12 labours of Hercules. Being furnished with complete armour by the gods, he boldly encountered the imposed labours. He subdued the Nemæan lion; the Lernean hydra; took alive the stag famous for its swiftness, with golden horns, and brazen feet; the Erimanthyan boar; cleansed the stables of Augeas; also the wild bull of Crete; killed the carnivorous birds which ravaged the lake Stymphalis in Arcadia; obtained the mares of Diomedes which fed on human flesh; obtained the girdle of the queen of the Amazons; killed the monster Geryon, king of Gades, and brought away his flocks; obtained the apples of the garden of the Hesperides, and brought upon earth the three-headed dog Cerberus, guardian of the entrance to the infernal regions. Besides these arduous labours, which the jealousy of Eurystheus imposed upon him, he also achieved others of his own accord equally celebrated. He accompanied the Argonants to Colchis before he delivered himself up to the king of Mycenæ. He assisted the gods in their wars against the giants, and it was through him alone that Jupiter obtained a victory. He conquered Laomedon, and pillaged Troy. Having at different times experienced three fits of insanity, in the second he slew Iphitus the brother of his beloved Iole, in the third he attempted to carry away the sacred tripod from Apollo's temple at Delphi, for which the oracle told him he must be sold as a slave. He was sold accordingly for three years to Omphale, queen of Lydia, who restored him to liberty and married him. After he had completed his slavery, he returned to Peloponnesus, where he re-established on the throne of Sparta Tynda- rus, who had been expelled by Hippocoon He became one of Dejanira's suitors, an married her after he had overcome all his ri vals. He was obliged to leave Calydon, hi father-in-law's kingdom, because he had inad vertently killed a man. He retired to th court of Ceyx, king of Trachinia. In his wa he was stopped by the streams of the Evenus where the centaur Nessus attempted to offe violence to Dejanira, under the perfidious pre tence of conveying her over the river. Hercu les perceived the distress of Dejanira, and kille the centaur, who as he expired gave her a tu nic, which as he observed had the power o recalling a husband from unlawful love. Cey received him and his wife with friendship Hercules was still mindful of Iole, who ha now fallen into his hands after having murder ed him. This excited the jealousy of Dejanira who sent him the tunic of Nessus, as he wa about to offer a sacrifice to Jupiter. This tuni was infected with poison, which penetrated hi bones. He attempted to pull off the fatal dress but it was too late. As the distemper was in curable, he implored the protection of Jupiter gave his bow and arrows to Philoctetes and erected a large burning pile on the top o mount Œta. He spread on the pile the skin o the Nemæan lion, and laid himself down upo it as on a bed, leaning his head on his club Philoctetes set fire to the pile, and the her saw himself on a sudden surrounded with th flames. The pile was suddenly surrounde with a dark smoke, and after the mortal part of Hercules were consumed, he was carried u to heaven in a chariot drawn by four horse The white poplar, among numerous othe things, was particularly dedicated to his servic Hercules is generally represented naked, wit strong and well-proportioned limbs, sometime covered with the skin of the Nemæan lion and holds a knotted club in his hand, on whic he often leans. The children of Hercule were as numerous as the labours he underwent and they became so powerful soon after hi death, that they alone had the courage to in vade all Peloponnesus. (Vid. HERACLIDÆ. He was father of Driman and Therimachu by Megara; of Ctesippus, by Astydamia; of Pa lemon, by Autonoe; of Everes, by Parthenope of Glycisonetes, Gyneus and Odites, by Deja nira; of Thessalus, by Chalciope; of The salus, by Epicaste; of Tlepolemus, by Astyoch Such are the most striking characteristics the life of Hercules, who is said to have sup ported for a while the weight of the heaven upon his shoulders, (Vid. ATLAS), and t have separated by the force of his arm the ce lebrated mountains, which were afterward called the boundaries of his labours. He held out by the ancients as a true pattern virtue and piety, and as his whole life ha been employed for the common benefit of man kind, he was deservedly rewarded with im mortality. His judicious choice of virtue i preference to pleasure, as described by Xeno phon, is well known.

HERCULES, in astronomy, an old northern constellation. Independent of Ramus and Cerburus, with which this constellation is commonly united, it contains 102 stars of the first six magnitudes, viz. 0. 0. 12. 12. 32. 46.

HERCULES'S PILLARS, in antiquity, a name given to two lofty mountains, situated one on the most southern extremity of Spain, and the other on the opposite part of Africa. They were called by the ancients Abyla and Calpe. They are reckoned the boundaries of the labours of Hercules; and, according to ancient tradition, they were joined together till they were severed by the arm of the hero, and a communication opened between the Mediterranean and Atlantic seas.

HERCYNIA SILVA, in ancient geography, the largest of forests. Its breadth was a journey of nine days to the best traveller. Taking its rise at the limits of the Helvetii, Nemetes, and Rauraci, it ran along the Danube to the borders of the Daci and Anartes, a length of 60 days journey, according to Cæsar, who appears to have been well acquainted with its true breadth, seeing it occupied all Lower Germany. It may therefore be considered as covering the whole of Germany; and most of the other forests may be considered as parts of it, though distinguished by particular names.

HERD. *s.* (heoɲð, Saxon.) 1. A number of beasts together. *Flocks* and *herds* are *sheep* and *oxen* or *kine* (*Addison*). 2. A company of men, in contempt or detestation (*Dryden*). 3. It anciently signified a keeper of cattle. (hyɲð, Saxon.) A sense still retained in composition; as, *goat-herd.*

To HERD. *v. n.* (from the noun.) 1. To run in herds or companies (*Dryden*). 2. To associate (*Walsh*).

To HERD. *v. a.* To throw or put into a herd (*Ben Jonson*).

HE'RDGROOM. *s.* (*herd* and *groom.*) A keeper of herds: not in use (*Spenser*).

HE'RDMAN. HE'RDSMAN. *s.* (*herd* and *man.*) One employed in tending herds: formerly, an owner of herds (*Sid. Dryd.*).

HERE. *ad.* (heɲ, Saxon.) 1. In this place (*Milton*). 2. In the present state (*Bacon*). 3. It is often opposed to *there* (*Sprat*).

HEREABO'UTS. *ad.* (*here* and *about.*) About this place (*Addison*).

HEREA'FTER. *ad.* In a future state *Shakspeare*).

HEREA'FTER. *s.* A future state (*Addison*).

HEREA'T. *ad.* At this (*Hooker*).

HEREBY'. *ad.* By this (*Watts*).

HEREDITABLE. *a.* (*hæres*, Latin.) Whatever may be occupied as inheritance (*Locke*).

HEREDITAMENTS, whatever moveable things a person may have to himself and his heirs by way of inheritance; and which, if not otherwise bequeathed, descend to him who is next heir, and not to the executors, as chattels do.

HERE'DITARILY. *ad.* (from *hereditary.*) By inheritance.

HEREDITARY. (from *hæres*, an heir.) An appellation given to whatever belongs to a family by right of succession from heir to heir. The term hereditary is also figuratively applied to good or ill qualities, either of body or mind, supposed to be transmitted from father to son: thus we say virtue and piety are hereditary qualities in such a family; that in Italy the hatred of families is hereditary; and that the gout, king's evil, madness, &c. are hereditary diseases.

HEREDITARY RIGHT, in the British constitution. The grand fundamental maxim upon which the *jus coronæ*, or right of succession to the throne of Britain depends, Sir William Blackstone takes to be this: that the crown is, by common law and constitutional custom, hereditary; and this in a manner peculiar to itself: but that the right of inheritance may from time to time be changed or limited by act of parliament; under which limitations the crown still continues hereditary.

HEREFORD, a city of England, situated on the river Wye, near the centre of the county to which it gives name. The name is said to be Saxon, and signify the Ford of the Army, being a long time a military station of the Saxons, before the Norman conquest. Besides, the cathedral; before the civil wars of the last century, there were five churches, two were then demolished. Hereford was formerly surrounded with walls and a ditch, and defended by a castle, said to have been as large as the castle at Windsor. The castle, great part of the wall, and three of the gates, are destroyed. The city is large, but not well built, though considerably improved within a few years. Hereford is said to have been erected into a bishop's see in the year 680: it is governed by a mayor and aldermen, &c. and has three markets weekly: Wednesday and Saturday for provisions, poultry, butter, &c.; and on Friday for live stock. The number of houses is 1460, and of inhabitants 6828. Lat. 52. 4 N. Lon. 2. 35 W.

HEREFORDSHIRE, a county of England, bounded on the north by Shropshire, on the east by Worcestershire and Gloucestershire, on the south by Monmouthshire, and on the west by the Welsh counties of Brecon and Radnor. The form is nearly circular, the mean length about thirty-seven miles, and the breadth thirty-three. It is divided into eleven hundreds, which contain one city (Hereford), six market towns, 176 parishes, 17,944 houses, and 89,190 inhabitants. It furnishes 520 men to the national militia. The market towns are Leominster, Weobley, Ledbury, Kington, Ross, and Bromyard; the two first, the city of Hereford, and the county, each return two members to the British parliament. The principal rivers are the Wye and the Munnow, or Mynnow. The climate is mild, and the land generally fertile; the face of the country is rich, beautiful, and picturesque. The quantity of land is about 781,440 acres, about 30,000 acres of which are uncultivated; including wood-lands. The soil is very different, from a strong clay to sand, yet all are productive. The principal part of

the land is employed in tillage, producing wheat, barley, oats, clover, turnips, &c. The county is in general well wooded, both in timber and copice wood, the value of which is much increased by the cultivation of hops. Herefordshire cyder has been long a liquor highly esteemed; of course orchards and the culture of apple-trees are a matter of considerable consequence. The sheep of this country were formerly in much estimation, and the wool valuable on account of its staple and fineness; but the superior quality of the wool not being thought adequate to atone for the smallness of the carcass, the farmers are in general desirous of obtaining a breed larger and more profitable.

HEREGELD, in old writers, a tribute or tax for the maintenance of an army.

HEREI'N. *ad.* (*here* and *in*.) In this.

HEREI'NTO. *ad.* In this (*Hooker*).

HEREO'F. *ad.* From this; of this (*Shak.*).

HEREO'N. *ad.* Upon this (*Brown*).

HEREO'UT. *ad.* Out of this place (*Spen.*).

HEREMI'TICAL. *a.* (*eremitical*, from *eremite*; *heremitique*, Fr.) Solitary; suitable to a hermit (*Pope*).

HE'RESIARCH. *s.* (*heresiarque*, French.) A leader in heresy (*Stillingfleet*).

HE'RESY. *s.* (*heresie*, Fr.; *hæresis*, Lat.) An opinion of private men different from that of the catholic and orthodox church (*Bacon*).

Heresy, in law, an offence against Christianity, consisting in a denial of some of its essential doctrines, publicly and obstinately avowed; being defined, "*sententia rerum divinarum humano sensu excogitata, palam docta et pertinaciter defensa.*" And here it must be acknowledged that particular modes of belief or unbelief, not tending to overturn Christianity itself, or to sap the foundations of morality, are by no means the object of coercion by the civil magistrate. What doctrines shall therefore be adjudged heresy, was left by our old constitution to the determination of the ecclesiastical judge; who had herein a most arbitrary latitude allowed him. For the general definition of an heretic given by Lyndewode extends to the smallest deviations from the doctrines of the holy church: "*hæreticus est qui dubitat de fide catholica, et qui negligit servare ea, quæ Romana ecclesia statuit, seu servare decreverat.*" Or, as the statute 2 Hen. IV. c. 15. expresses it in English, "teachers of erroneous opinions, contrary to the faith and blessed determinations of the holy church." Very contrary this to the usage of the first general councils, which defined all heretical doctrines with the utmost precision and exactness. And what ought to have alleviated the punishment, the uncertainty of the crime, seems to have enhanced it in those days of blind zeal and pious cruelty. It is true that the sanctimonious hypocrisy of the canonists went at first no farther than enjoining penance, excommunication, and ecclesiastical deprivation, for heresy; though afterwards they proceeded boldly to imprisonment by the ordinary, and confiscation of goods *in pios usus*. But in the mean time they had prevailed upon the weakness of bigoted princes to make the civil power subservient to their purposes, by making heresy not only a temporal, but even a capital offence: the Romish ecclesiastics determining, without appeal, whatever they pleased to be heresy, and shifting off to the secular arm the odium and drudgery of executions; with which they themselves were too tender and delicate to intermeddle. Nay, they pretended to intercede and pray, on behalf of the convicted heretic, *ut citra mortis periculum sententiæ circa eum moderetur*: well knowing that at the same time they were delivering the unhappy victim to certain death. Hence the capital punishments inflicted on the ancient Donatists and Manichæans by the emperors Theodosius and Justinian: hence also the constitution of the emperor Frederic mentioned by Lyndewode, adjudging all persons without distinction to be burnt with fire who were convicted of heresy by the ecclesiastical judge. The same emperor, in another constitution, ordained, that if any temporal lord, when admonished by the church, should neglect to clear his territories of heretics within a year, it should be lawful for good catholics to seize and occupy the lands, and utterly to exterminate the heretical possessors. And upon this foundation was built that arbitrary power so long claimed and so fatally exerted by the pope, of disposing even of the kingdoms of refractory princes to more dutiful sons of the church. The immediate event of this constitution was something singular, and may serve to illustrate at once the gratitude of the holy see, and the just punishment of the royal bigot; for, upon the authority of this very constitution, the pope afterwards expelled this very emperor Frederic from his kingdom of Sicily, and gave it to Charles of Anjou.

Christianity being thus deformed by the demon of persecution upon the continent, we cannot expect that our own island should be entirely free from the same scourge. And therefore we find among our ancient precedents a writ *de heretico comburendo*, which is thought by some to be as ancient as the common law itself. However, it appears from thence that the conviction of heresy by the common law was not in any petty ecclesiastical court, but before the archbishop himself in a provincial synod; and that the delinquent was delivered over to the king to do as he should please with him: so that the crown had a controul over the spiritual power, and might pardon the convict by issuing no process against him; the writ *de hæretico comburendo* being not a writ of course, but issuing only by the special direction of the king in council.

But in the reign of Henry IV. when the eyes of the christian world began to open, and the seeds of the protestant religion (though under the opprobrious name of lollardy) took root in this kingdom; the clergy, taking advantage from the king's dubious title to demand an increase of their own power, obtained an act of pa

ment, which sharpened the edge of persecution to its utmost keenness. For, by that statute, the diocesan alone, without the intervention of a synod, might convict of heretical tenets; and unless the convict abjured his opinions, or if after abjuration he relapsed, the sheriff was bound *ex officio*, if required by the bishop, to commit the unhappy victim to the flames, without waiting for the consent of the crown. By the statute 2 Hen. V. c. 7. lollardy was also made a temporal offence, and indictable in the king's courts; which did not thereby gain an exclusive, but only a concurrent, jurisdiction with the bishop's consistory.

Afterwards, when the final reformation of religion began to advance, the power of the ecclesiastics was somewhat moderated; for though what heresy is was not then precisely defined, yet we are told in some points what it is not: the statute 25 Hen. VIII. c. 14. declaring that offences against the see of Rome are not heresy, and the ordinary being thereby restrained from proceeding in any case upon mere suspicion; that is, unless the party be accused by two credible witnesses, or an indictment of heresy be first previously found in the king's courts of common law. And yet the spirit of persecution was not yet abated, but only diverted into a lay channel. For in six years afterwards, by statute 31 Hen. VIII. c. 14. the bloody law of the six articles was made, which established the six most contested points of popery, transubstantiation, communion in one kind, the celibacy of the clergy, monastic vows, the sacrifice of the mass, and auricular confession; which points were "determined and resolved by the most godly study, pain, and travail of his majesty: for which his most humble and obedient subjects, the lords spiritual and temporal, and the commons, in parliament assembled, did not only render and give unto his highness their most high and hearty thanks;" but did also enact and declare all oppugners of the first to be heretics, and to be burnt with fire; and of the five last to be felons, and to suffer death. The same statute established a new and mixed jurisdiction of clergy and laity for the trial and conviction of heretics; the reigning prince being then equally intent on destroying the supremacy of the bishops of Rome, and establishing all other their corruptions of the christian religion.

Without perplexing this detail with the various repeals and revivals of these sanguinary laws in the two succeeding reigns, let us proceed to the reign of queen Elizabeth; when the reformation was finally established with temper and decency, unsullied with party-rancour, or personal caprice and resentment. By statute 1 Eliz. c. 1. all former statutes relating to heresy are repealed, which leaves the jurisdiction of heresy as it stood at common law; viz. as to the infliction of common censures, in the ecclesiastical courts; and in case of burning the heretic, in the provincial synod only. Sir Matthew Hale is indeed of a different opinion, and holds that such power resided in the diocesan also; though he agrees, that in either case the writ de heretico comburendo was not demandable of common right, but grantable or otherwise merely at the king's discretion. But the principal point now gained was, that by this statute a boundary is for the first time set to what shall be accounted heresy; nothing for the future being to be so determined, but only such tenets, which have been heretofore so declared, 1. by the words of the canonical scriptures; 2. by the first four general councils, or such others as have only used the words of the holy Scriptures; or, 3. which shall hereafter be so declared by the parliament, with the assent of the clergy in convocation. Thus was heresy reduced to a greater certainty than before; though it might not have been the worse to have defined it in terms still more precise and particular: as a man continued still liable to be burnt, for what perhaps he did not understand to be heresy, till the ecclesiastical judge so interpreted the words of the canonical scriptures.

For the writ de hæretico comburendo remained still in force; and we have instances of its being put in execution upon two baptists in the seventeenth of Elizabeth, and two Arians in the ninth of James I. But it was totally abolished, and heresy again subjected only to ecclesiastical correction, pro salute animæ, by virtue of the statute 29 Car. II. c. 9: for, in one and the same reign, our lands were delivered from the slavery of military tenures; our bodies from arbitrary imprisonment by the habeas corpus act; and our minds from the tyranny of superstitious bigotry, by demolishing this last badge of persecution in the English law.

Every thing is now less exceptionable, with respect to the spiritual cognizance and spiritual punishment of heresy: but still much is wanting to the amelioration of the laws in this respect, even in the opinion of the most pious and excellent clergymen of the established church. Certainly what constitutes heresy ought to be more strictly defined, and no prosecution permitted, even in the ecclesiastical courts, till the tenets in question are by proper authority previously declared to be heretical. Under these restrictions, some think it necessary for the support of the national religion that the officers of the church should have power to censure heretics; yet not to harass them with temporal penalties, much less to exterminate or destroy them. The legislature hath indeed thought it proper that the civil magistrate should again interpose, with regard to one species of heresy, very prevalent in modern times; for by statute 9 and 10 W. III. c. 32. if any person educated in the Christian religion, or professing the same, shall by writing, printing, teaching, or advised speaking, deny any one of the persons in the holy Trinity to be God, or maintain that there are more gods than one, he shall undergo the same penalties and incapacities which were just now mentioned to be inflicted on apostacy by the same statute.

HERETIC, in a general sense, is one that sets up to be the head, or chooses to join himself to a particular religious sect.

Heretic, in a bad sense, according to the opinion of Whitby, Foster, and many others, is one who knowingly espouses a false doctrine, is insincere in his profession, and asserts and defends what he is convinced is contrary to Christianity, and consequently supports the interest of a faction, in order to serve some bad designs. According to this opinion, a heretic not only entertains wrong sentiments of christianity, but doth this wilfully, and with an ill intention: so that no mere error of the judgment can be heresy, and no honest man, who is not condemned of himself, can possibly be a heretic.

The heretics, whom, in the New Testament, we are directed to avoid, were not the humble, modest, and peaceable, though erroneous christians, who adhered to the authority of Christ, and desired to know and do his will; but the proud, pragmatical, turbulent party-men, who disturbed and divided the church by their impositions and innovations, on the terms of brotherly affection and christian communion, and by assuming an authority over their fellow-christians. Heresy, in the sense of scripture, doth not consist in simple error; nor were those heretics who were anathematized and persecuted; but only those who anathematized and persecuted others, refusing to acknowledge them for true christians, on account of their supposed or real mistakes: agreeably to this sense of the appellation, it is justly observed by Mr. Hallet, that the pope is the greatest heretic in the world. See Hallet's Notes, &c. vol. iii. disc. ix. p. 390. and Furneaux's Letters to Judge Blackstone, p. 30.

A real heretic is properly he who maintains a false opinion, out of a spirit of obstinacy, faction, or hypocrisy. A heretic makes profession of christianity, by which he is distinguished from an infidel, Jew, and idolater.

A man does not become an heretic by doing a thing condemned or forbidden by the gospel, and of consequence repugnant to the christian faith; but by a stiff, disingenuous, wilful, turbulent adherence to an opinion opposite to some article of the christian faith, whether it regard speculation or practice.

HERE'TICAL. *a.* (from *heretic.*) Containing heresy (*Decay of Piety*).

HERE'TICALLY. *ad.* With heresy.

HERETO'. *ad.* (*here* and *to.*) To this; add to this.

HERETOCHS, among our Saxon ancestors, signified the same with dukes or duces, denoting the commanders or leaders of their armies.

HERETOFO'RE. *ad.* (*hereto* and *fore.*) Formerly; anciently (*South*).

HEREUNTO'. *ad.* (*here* and *unto.*) To this (*Locke*).

HEREWITH. *ad.* With this (*Hayward*).

HERFORD, or HERVORDEN, a free imperial town of Westphalia, capital of the county of Ravensburg, with a famous nunnery, belonging to the protestants of the confession of Augsburg, whose abbess is a princess of the empire. Lat. 52. 9 N. Lon. 8. 47 E.

HERGRUNDT, a town of Upper Hungary, noted for its mines of vitriol, which are very rich. Lat. 48. 30 N. Lon. 18. 15 E.

HERI, an island in the Indian Ocean, [illegible] miles N.N.W. of Ternate. It is not more than two miles in circumference, but very fertile and well inhabited.

HERIOT, in law, signifies a tribute given to the lord for his better preparation towards war. And by the laws of Canute, it appears, that at the death of the great men of this nation, so many horses and arms were to be paid for as they were in their respective life-times obliged to keep for the king's service. A heriot was first paid in arms and horses; it is now by some custom sometimes the best live beast which the tenant dies possessed of, sometimes the best inanimate goods, under which a jewel or piece of plate may be included. Some are due by custom, some by tenure, and by reservation on deeds executed within time of memory: those due by custom are the most frequent.

For an heriot service, or for an heriot reserved by way of tenure, the lord may either seize or distrain.

HERISSON, in fortification, a beam armed with a great number of iron spikes, with their points outwards, and supported by a pivot, on which it turns.

HE'RITABLE. *a.* (*hæres*, Lat.) Capable to inherit whatever may be inherited (*Hale*).

HE'RITAGE. *s.* (*heritage*, French.) 1. Inheritance; estate devolved by succession; estate in general (*Rogers*). 2. (In divinity.) The people of God.

HERITIE'RA. Looking-glass plant. In botany, a genus of the class monœcia, order monodelphia. Calyx five-toothed; corolless. Male: anthers ten, without filaments. Fem. germs five; drupes dry with one subglobular seed. One species: an East Indian tree.

HERMÆA, ancient Greek festivals in honour of Hermes or Mercury. At the Cretan Hermæa the servants sat down at the table while their masters waited.

HERMANN (James), a learned mathematician of the academy of Berlin, and member of the academy of sciences at Paris, was born at Basil in 1678. He was a great traveller; and for 6 years was professor of mathematics at Padua. He afterwards went to Russia, being invited thither by the Czar in 1724, as well as his compatriot Daniel Bernoulli. On his return to his native country, he was appointed professor of morality and natural law at Basil; where he died in 1733, at 55 years of age. He wrote several mathematical and philosophical pieces, in the memoirs of different academies, and elsewhere: but his principal work is the Phoronomia, or two Books on the Forces and Motions of both Solid and Fluid Bodies; 4to, 1716: a very learned work on the new mathematical physics.

HERMANNIA. In botany, a genus of the class monadelphia, order pentandria. Calyx simple, five-cleft; petals five, spirally hooded; filaments lanceolate; styles five; capsule five-celled, many seeded. Thirty species; all shrubs and natives of the Cape of Good Hope. They are propagated by cuttings, planted during any of the summer months, in a bed of fresh earth, observing to water and shade them till they have taken root: in about six weeks after planting they should be taken up, with a ball of earth at their roots, and planted in pots, filled with light fresh earth, placing them in a shady situation till they have taken new root; after which they may be exposed to the open air till sometime in October, when they must be removed to the green-house, and have as much free air as possible: they must be frequently watered, and will require to be new potted twice a year, in May and September. The plants are also raised from seeds, which must be sown upon a moderate hot-bed: when the plants come up, they should be transplanted into small pots, and plunged into another moderate hot-bed, in order to promote their rooting; after that they must be hardened by degrees to bear the open air, and may then be treated as the old plants; but they seldom produce good seeds in this country.

HERMANSTADT, a large and strong city, the capital of Transylvania, with a bishop's see. It is seated on the Seben, and is fortified with a double wall, and a deep moat. Lat. 46. 25 N. Lon. 24. 40 E.

HERMAPHRODITE. (*hermaphroditus*, ερμαφροδιτος, from Ἑρμης, Mercury, and, Αφροδιτη, Venus, i. e. partaking of both sexes). The true hermaphrodite of the ancients was, the man with male organs of generation, and the female stature of body, that is, narrow chest and large pelvis; or the woman with female organs of generation, and the male stature of body, that is, broad chest and narrow pelvis. The term is now often used to express any lusus naturæ wherein the parts of generation appear to be a mixture of both sexes. But it is of still farther use in natural history, and accurately applied to a variety of the lower classes of animals, as insects and worms, as well as to most classes of vegetables. Thus snails are hermaphrodites: they possess the organs of both sexes, but cannot propagate without copulating, the male organs of the one being applied to the female organs of the other, and vice versa. The female aphis is an extraordinary hermaphrodite: she generally propagates from union with the male, but if refused or precluded from possessing it, she is said to propagate from her own powers alone. Upon this subject however there is some doubt: for it is probable that both the aphis and the hen will at times propagate successively, or at least more than once, from a single coition.

Hermaphrodite flower. In botany, having both anther and stigma. An hermaphrodite plant is that which has only hermaphrodite flowers.

HERMAPHRODITICAL. *a.* (from *hermaphrodite*.) Partaking of both sexes (*Brown*).

HERMAPHRODITUS, in fabulous history, a son of Venus and Mercury educated by the Naiades. At the age of 15 he began to travel to gratify his curiosity. When he came to Caria he bathed himself in a fountain, and Salmacis, the nymph who presided over it, became enamoured of him, and attempted to seduce him. He continued deaf to all entreaties, and Salmacis, endeavouring to obtain by force what was denied to prayers, closely embraced him, and entreated the gods to make them two but one body. Her prayers were heard, and Salmacis and Hermaphroditus, now two in one body, still preserved the characteristics of both their sexes. Hermaphroditus begged the gods that all who bathed in that fountain might become effeminate.

HERMAS. In botany, a genus of the class polygamia, order monœcia. Herm.: umbel terminal; involucres general and partial; umbellets with truncate rays, the central ones floriferous; petals five: stamens five, barren; seeds in pairs, nearly orbicular. Male umbels lateral; involucres general and partial; umbellets many-flowered; petals five, stamens five, fertile. Five species: all herbs of the Cape.

HERMATHENA, a statue representing Mercury and Minerva in the same body, was generally placed in schools where eloquence and philosophy were taught, because these deities presided over the arts and sciences.

HERMES TRISMEGISTUS, an Egyptian priest and philosopher; who taught his countrymen the cultivation of the vine, the measurement of lands, and the knowledge of hieroglyphics. He lived as it is believed more than 1900 years before the christian æra. Clemens Alexandrinus has recorded a list of more than 40 of this philosopher's works, none of which remain among all that list. Not one treatise is professedly written on chemistry, although we find some on every other science, except that one which has received from him the name of Hermetic philosophy.

Hermes or Herma, among antiquaries, a sort of square or cubical figure of the god Mercury, usually made of marble, though sometimes of brass or other materials, without arms or legs, and planted by the Greeks and Romans in their crossways. Servius gives us the origin thereof in his comment on the eighth book of the Æneid. Some shepherds, says he, having one day caught Mercury, called by the Greeks Hermes, asleep on a mountain, cut off his hands; from which he, as well as the mountain where the action was done, became denominated Cyllenius, from κυλλος maimed: and thence, adds Servius, it is that certain statues without arms are denominated Hermeses or Hermæ. But this etymology of the epithet of Cyllenius contradicts most of the other ancient authors; who derive it hence that Mercury was born at Cyllene, a city o Elis, or even on the mountain Cyllene itself which had been thus called before him.

HERMERACLES, in antiquity, a stat

compounded of the figures of Mercury and Hercules.

HERMETIC, or HERMETICAL ART, a name given to chemistry, on a supposition that Hermes Trismegistus was the inventor of the art, or that he excelled therein. See THOTH.

HERMETICAL PHILOSOPHY, is that which undertakes to solve and explain all the phenomena of nature, from the three chemical principles, salt, sulphur, and mercury.

HERMETICAL PHYSIC, or MEDICINE, is that system or hypothesis in the art of healing which explains the causes of diseases, and the operations of medicine, on the principles of the hermetical philosophy, and particularly on the system of alkali and acid. It has been long exploded.

HERMETICAL SEAL, in chemistry, a manner of stopping or closing glass vessels so very accurately that nothing can escape. It is performed by heating the neck of the vessel in the flame of a lamp or otherwise, till it be ready to melt, and then with a pair of pincers twisting or bending it till the orifice is closed: it is then said to be hermetically sealed.

HERMETICALLY. *ad.* According to the hermetical or chymic art (*Bentley*).

HERMHARPOCRATES, in antiquity, a figure of a deity composed of Mercury and Harpocrates.

HERMIONE, a daughter of Mars and Venus, who married Cadmus. The gods, except Juno, honoured her nuptials with their presence, and she received, as a present, a rich veil and a splendid necklace which had been made by Vulcan. She was changed into a serpent with her husband Cadmus, and placed in the Elysian fields. 2. A daughter of Menelaus and Helen. She was privately promised in marriage to Orestes the son of Agamemnon; but her father, ignorant of this pre-engagement, gave her hand to Pyrrhus the son of Achilles. Pyrrhus, at his return from Troy, carried home Hermione and married her. Hermione, tenderly attached to her cousin Orestes, looked upon Pyrrhus with horror and indignation. According to others, however, Hermione received the addresses of Pyrrhus with pleasure. Her jealousy for Andromache, according to some, induced her to unite herself to Orestes, and to destroy Pyrrhus. She gave herself to Orestes after this murder, and received the kingdom of Sparta as a dowry.

HERMIONE, in ancient geography, a considerable city of Argolis. It was in ruins, except a few temples, in the time of Pausanias; who says that the new city was at the distance of four stadia from the promontory on which the temple of Neptune stood. It gave name to the Sinus Hermionicus, a part of the Sinus Argolicus.

HERMIT, *s.* (*hermite*, French.) 1. A solitary; an anchoret; one who retires from society to contemplation and devotion. 2. A [illegible]; one bound to pray for another: [illegible] (*Shakspeare*).

HERMITAGE. *s.* (*hermitage*, French.) [illegible] or habitation of a hermit (*Addison*).

HER'MITESS. *s.* (from *hermit*.) A woman retired to devotion.

HER'MITICAL. *a.* (from *hermit*.) Suitable to a hermit.

HERMODACTYL. See HERMODACTYLUS.

HERMODACTYLUS. (*hermodactylus*, ἑρμοδακτυλος.) Etymologists have always derived this word from Ἑρμης, Mercury, and δακτυλος, a finger. It is probably named from Hermus, a river in Asia, upon whose banks it grows, and δακτυλος, a date, which it is like). The root of a species of colchicum, not yet ascertained, but supposed to be the colchicum illyricum of Linnæus, of the shape of a heart, flattened on one side, with a furrow on the other, of a white colour, compact and solid, yet easy to cut or powder. This root, which has a viscous, sweetish, farinaceous taste, and no remarkable smell, is imported from Turkey. Their use is totally laid aside in the practice of the present day. Formerly they were esteemed as cathartics, which power is wanting in those that reach this country.

HERMODORUS, a philosopher of Ephesus, who is said to have assisted, as interpreter, the Roman decemvirs in the composition of the ten tables of laws, which had been collected in Greece (*Cicero*).—2. A poet who wrote a book called [illegible].

HERMON, or AERMON, in ancient geography, a mountain of the Amorites, called Sanior by the Phœnicians, and Sanir or Senir by the Amorites, on the east of Jordan. It is also called Sion (Moses); but must not be confounded with the Sion of Jerusalem. By the Sidonians it was called Scirion; in the Vulgate, it is called Sirion. Joshua informs us, that it was the dominion of Og king of Bashan; which must be understood of its south side. It is never particularly mentioned by profane writers; being comprised under the appellation Libanus, or Antilibanus, with which mountain it is joined to the east. It is also called Hermonim plurally, Psalm xliii. 6. because it was extensive, and contained several mountains.

HERMOTIMUS, a famous prophet of Clazomenæ. It is said that his soul separated from his body, and wandered in every part of the earth to explain futurity, after which it returned again and animated his frame. His wife, who was acquainted with the frequent absence of his soul, took advantage of it and burnt his body, as if totally dead, and deprived the soul of its natural receptacle. Hermotimus received divine honours in a temple at Clazomenæ, into which it was unlawful for women to enter.

HERMUS, in ancient geography, a river of Ionia, which rose near Dorylœum, a town of Phrygia, and passed through the plains of Smyrna, down to the sea.

HERN. *s.* (Contracted from *heron*).

HERMANDIA. Jack in a box. Myrobolan. In botany, a genus of the class monœcia, order triandria. Male: calyx three-parted; corol three-petalled. Fem. calyx very entire,

truncate; corol six-petalled; drupe hollow with an open mouth, and moveable kernel. Two species.

1. H. sonora: with peltate leaves; a native of the West Indies.

2 H. ovigera; with ovate leaves, petioled at the base. A native of India. Both are lofty trees with a whitish brittle wood, in their native habitations; but seldom in transplantation rise higher than a shrub of moderate tallness. The latter is esteemed in India an antidote against poisoned arrows, but on no sufficient authority.

HERNIA (*hernia*, from ἔρνος, a branch, because it protrudes forwards). Hernia is a swelling produced by the falling down, or protrusion, of some part or parts which ought naturally to be contained within the cavity of the belly.

The places in which these tumours make their appearance, in order to form what is called hernia, are the groin, the navel, the labia pudendi, the upper and fore part of the thigh, and every point of the anterior part of the abdomen.

The parts which, by being thrust forth from the cavity in which they ought naturally to remain, and which form these tumours, are, a portion of the omentum, a part of the intestinal canal, and sometimes, though very rarely, the stomach and liver.

From these two circumstances, of situation and contents, are derived all the different appellations by which hernias are distinguished; for example, they are called inguinal, scrotal, femoral, umbilical, and ventral, as they happen to make their appearance in the groin, scrotum, thigh, navel, or belly. If a portion of intestine only forms it, it is called enterocele, hernia intestinalis, or gut rupture: if a piece of omentum only, epiplocele, hernia, omentalis, or caul rupture; and if both intestine and omentum contribute mutually to the formation of the tumour, it is called entero-epiplocele, or compound rupture.

If the piece of gut or caul descends no lower than the groin, it is said to be incomplete, and is called bubonocele; if the scrotum be occupied by either of them, the rupture is said to be complete, and bears the name of oscheocele; the latter used by our forefathers to be attributed to laceration of the peritoneum, the former to its dilatation merely.

The opinion that the scrotal hernia is occasioned by a forcible division or breach made in the peritoneum has always been, and still is, with the unknowing, a very prevailing one, though without any foundation in truth; both the scrotal and femoral pass out from the abdomen by openings which are natural to every human body, as well those who have not ruptures as those who have. The former, that is the scrotal, descend by means of an aperture in the tendon of the external oblique muscle, near the groin, designed for the passage of the spermatic vessels in men, and the round ligaments of women; and the latter, under the hollow made by Poupart's or Fallopius's ligaments, at the upper part of the thigh, along with the great crural vein and artery.

Horses and other quadrupeds are subject to various species of this disease, as well as man. In the horse more especially we meet with it from accidents and violent exertion. It is thus ably described by Gibson. "When any part of the guts or caul makes its way through the muscles of the lower belly, it is called a rupture; when any part of the guts falls into the scrotum, it is said to be a complete rupture; when at the navel, it is called an umbilical rupture. I once saw a fine Spanish stone horse with a complete rupture; the swelling was so extremely large, that the gut extended the scrotum down to his hock. This circumstance rendered the cure in a great measure impracticable. It was the only one of the kind I ever saw, and, in fact, it is a case that must seldom happen, the position of a horse's body being such as cannot so easily expose him to ruptures into the scrotum, as men are whose posture is erect. I also have seen a gelding, where probably some part of the gut or peritoneum had made its way through the vaginal passage, into the membranous parts of the sheath on the right side; for the omentum or caul seldom reaches so low in a horse, his continual horizontal motion throwing it for the most part forward in wrinkles. The swelling was about the size of a goose's egg, a great part of which might be thrust back with the finger into the cavity of the lower belly, but immediately returned in the manner of a flatulent tumour; and perhaps there might be some portion of air along with it. The cure was never attempted, because it was little or no hindrance to the horse in his business, the swelling being generally fuller when he stood still than when he worked.

"But the most usual ruptures are more upwards, and proceed from strains in working, or from being staked, or gored by bullocks, violent kicks from other horses, very high leaps over gates and hedges; all which things sometimes divide the muscles of the lower belly, and oft-times without piercing or rending the skin, whereby a portion of the intestines, with a part of the peritoneum, and when the wound happens to be forward, part of the caul may also be lodged where these muscles are separated or divided, and so cause a swelling of a proportion and size equal to the rent made in the part. An instance of this kind I once saw, of a very fine Flanders mare, that had a rupture near her navel of a considerable size, which however did not prevent her working, but as it grew larger it became troublesome; and a very eminent and able surgeon imagining the substance to be fleshy, and of the nature of a wen, persuaded me to have some trial made of it by excision, for it felt solid as she stood on her legs, which might be owing to part of the caul (which is always rolled forwards in working horses), and along with this, an adventitious growth of flesh, caused by the rending of the

muscles and membranes; for when she was thrown upon her back, part of the substance went inwards, and plainly discovered her malady to be a rupture.

"I have known some few instances of umbilical ruptures, that have been caused by rowels in the belly, when they have been cut too deep, and perhaps were afterwards neglected. And I knew a horse with a rupture of this kind perform a journey of several hundred miles, without any great inconvenience, only that he always went sluggish at his first setting out, but more cheerfully as he emptied himself. Nevertheless this is a very great defect, and few horses with such infirmities can be long useful. I have seen other ruptures, and these are indeed the most usual, that push out on the sides of the lower belly, where the tunica vaginalis passes through the rings of the muscles, with the spermatic vessels, into the scrotum; and in geldings they seldom reach further than the first ring, which is a little way above the groin, but when they happen on the sides of the flanks, they are then for the most part owing to such accidents as have been above-mentioned. They generally bunch out about the size of a man's fist, and are fullest when the horse stands still in the stable, especially after feeding and watering, and in broken-winded horses they rise and fall with the agitation of the flanks; they are soft, and yield to the pressure of the hand, and in most of them one may fell the vacuity through which the viscera make their way immediately to the skin. But as there is no absolute cure to be expected in such cases, the safest way is to feed moderately, and in small quantities, with small draughts of water, and to use such horses gently. In all beginning ruptures, a fomentation made of oak bark, boiled in equal parts of the sharpest vinegar, and smith's forge water, have been used by farriers for a general application; for in horses, bandage and trusses of any kind are for the most part impracticable."

This experienced writer concludes his subject with an instance of a very fine gelding that was killed by a rupture, and in a manner somewhat extraordinary. "This horse," says he, "belonged to a person of distinction, and was abroad with our army in Germany and the Netherlands, He received a hurt while he stood at the piquet along with some other horses; yet went through his business very well for the space of two years, notwithstanding that accident; but after a hard day's hunting, was taken with the gripes, of which he died. I was sent for to examine his abdomen, where there was something that surprised all that saw him opened. The ring through which the tunica vaginalis passes appears plainly in a horse to be formed of the tendinous part of the muscles, has the strength and firmness of a ligament, and resembles a hem or large oilet-hole, such as we see in the sails of a ship. One half of this ring was torn off from the flesh, [illegible] across the orifice, which tied up a [illegible]ure of the colon so tight that nothing could pass through it; and this was evidently the cause of his sudden death.

"I have briefly related this case," adds he, "in order that those who are employed about horses may be so far informed in such things as to examine them carefully when the gripes, or any other sudden disorder, seizes them. For if the duplicature of the gut had been forced back into the cavity of the lower belly, when he was first seized, his death might probably have been prevented; for this rupture seldom appeared larger than a man's fist."

Hernia congenita (so called because it is, as it were, born with the person). This species of hernia consists in the adhesion of a protruded portion of intestine or omentum to the testicle, after its descent into the scrotum. This adhesion takes place while the testicle is yet in the abdomen. Upon its leaving the abdomen it draws the adhering intestine or omentum along with it into the scrotum, where it forms the hernia congenita.

Hernia cruralis. Femoral hernia. There is no difference between an inguinal and crural hernia, but what arises from the places where they are formed. Men are most subject to inguinal, and women to crural hernia, proceeding from the figure of the pelvis, which is largest in women, while the uterus and the bladder concur by their bulk to force the intestines on each side the ossa ilia, being more spread in them than in men, afford larger spaces for the parts to be received on the sides, and to recede from the groin. In the crural hernia, the parts generally pass out of the abdomen under Poupart's ligament, in the space formed by the attachments of this ligament to the os pubis. It is owing to the fat which envelopes the crural vessels that the viscera more easily slip down under this ligament; and those vessels are always found behind the hernia. The parts extend themselves afterwards more or less under the aponeurosis, which proceeds from the ligament, and covers the muscles that form the fore part of the thigh. The peritoneum, in its natural state, obstructs their passage here, as it does at the ring, but it likewise gives way, as in the inguinal hernia, to the pressure of the viscera, and, being distended, forms a hernial bag, of a greater or less size according to the bulk of the prolapsed parts. In the inguinal hernia, the colon is sometimes found, and the cæcum very seldom; but in the crural hernia the bag of the cæcum is frequently seen with the beginning of the colon.

Hernia humoralis. Inflammation of the testicle. Here the term hernia is very improperly applied: there is certainly tumour in the disease, as there must necessarily be in all local inflammations of the soft parts: but if tumour, or inflammatory tumour alone were to constitute a hernia, there would be neither discrimination in the genus nor termination in the species of the disease. It is more accurately named Orchitis, which see.

Hernia incarcerata. A rupture is

said to be incarcerated or strangulated, when on a sudden the protruding viscus cannot be reduced into its proper cavity, and bad symptoms arise, as vomiting, colic, and obstipation, fever and tumour of the part; which alarming symptoms arise either from obstruction of the intestines, or from suspended circulation of the blood. The danger in this state depends on the narrowness of the strangulating opening, and the extent of the parts which have fallen down.

HERNIA INGUINALIS. The hernia inguinalis is so called because it appears in both sexes at the groin. It is one of the divisions of hernia, and includes all those herniæ in which the parts displaced pass out of the abdomen through the ring, that is, the arch formed by the aponeurosis of the musculous obliquus externus in the groin, for the passage of the spermatic vessels in men, and the round ligament in women. The parts displaced that form the hernia, the part into which they fall, the manner of the hernia being produced, and the time it has continued, occasion great differences in this disorder. There are three different parts that may produce a hernia in the groin, viz. one or more of the intestines, the epiploon, and the bladder. That which is formed by one or more of the intestines, was called by the ancients enterocele. The intestine which most frequently produces the hernia is the ilium: because, being placed in the iliac region, it is nearer the groin than the rest; but notwithstanding the situation of the other intestines, which seems not to allow of their coming near the groin, we often find the jejunum, and frequently also a portion of the colon and cæcum, included in the hernia. It must be remembered, that the mesentery and mesocolon are membranous substances capable of extension, which, by little and little, are sometimes so far stretched by the weight of the intestines as to escape with the ilium, in this species of hernia. The hernia made by the epiploon is called epiplocele; as that caused by the epiploon and one of the intestines together is called entero-epiplocele. The hernia of the bladder is called cystocele. Hernia of the bladder is uncommon, and has seldom been known to happen but in conjunction with some of the viscera. When the parts, having passed through the abdominal rings, descend no lower than the groin, it is called an incomplete hernia; when they fall into the scrotum in men, or into the labia pudendi in women, it is then termed complete.

HERNIARIA. (*herniaria*, from *hernia*, a rupture, so called from its supposed efficacy in curing ruptures). Rupture-wort. In botany, a genus of the class pentandria, order digynia. Calyx five parted inferior; corolless: stamens with five filiform scales between them: capsule one-seeded, covered with the calyx. Six species, chiefly natives of Spain or the Alps, but two of them, H. glabra, and H. hirsuta, common to our own country. The former of these two was long ago esteemed efficacious in the cure of hernia: but has long since been discarded from every dispensary.

HERNIOTOMY. (*herniatomia*, from *hernia*, and τεμνω, to cut). The operation to remove the strangulated part in cases of incarcerated hernia. This term ought to be expunged from the chirurgical vocabulary, as an illegitimate compound of Latin and Greek. As the Greek κηλη is now generally appropriated to hernial tumours, it should give way to celotomy, which indeed has been already made use of by more correct writers.

HERO, in pagan mythology, a great and illustrious person, of a mortal nature, though supposed by the populace to partake of immortality, and after his death to be placed among the number of the gods. The word is formed of the Latin *heros*, and that of the Greek ηρως, semi-deus, "demi-god." The Greeks erected columns and other monuments over the tombs of their heroes, and established a kind of worship in honour of the manes both of their heroes and heroines. The Romans also raised statues in honour of their heroes; but there were six of their heroes of a superior order, and who were supposed to be admitted into the community of the twelve great gods: these were Hercules, Bacchus, Esculapius, Romulus, Castor, and Pollux. Writers have distinguished between the worship which the ancients paid to their heroes and that offered to their gods. The latter, it is said, consisted of sacrifices and libations; the former was only a kind of funeral honour, in which they celebrated their exploits, concluding the rehearsal with feasts.

HERO is also used in a more extensive sense, for a great, illustrious, and extraordinary personage; particularly in respect of valour, courage, intrepidity, and other military virtues. F. Bouhours makes this distinction between a great man and a hero, that the latter is more daring, fierce, and enterprising; and the former more prudent, thoughtful, and reserved. In this sense we properly say, Alexander was a hero, Julius Cæsar a great man. Women who evince any extraordinary heroism of character are called heroines.

HERO of a poem or romance, is the principal personage, or he who has the chief part in it. Thus the hero of the Iliad is Achilles; of the Odyssey, Ulysses; of the Æneid, Æneas; of Tasso's Jerusalem, Godfrey of Bulloign; of Milton's Paradise Lost, Adam; though Mr. Dryden will have the Devil to be Milton's hero, because he gets the better of Adam, and drives him out of Paradise. Many of the critics find fault with the hero of the Æneid, for being too delicate, wanting the fire, firmness, and uncontroulable spirit remarkable in the hero of the Iliad. Piety, tenderness, and submission to the gods, are virtues of the middle class of mankind; they do not strike enough for a hero, who is to be the instrument of such notable exploits.

In answer to this, F. Bossu observes, that Æneas's character was not to be formed on the model either of Achilles or Ulysses; nor to be of the same kind with them, as the fable and design of the Æneid were very different from

those of the Iliad and Odyssey. Virgil's design was to persuade the Romans to receive a new form of government, and a new master; who must have all the qualities requisite for the founder of a state, and all the virtues which make a prince beloved.

HERO, in fabulous history, a priestess of Venus, lived at Abydos, in a tower situated on the bank of the Hellespont. She being beloved by Leander, who lived at Sestos, on the other side of the streight, he every night swam over to visit her, but the light being put out in a stormy night, the youth missed his way, and was drowned; on which Hero threw herself into the sea, and was also drowned.

HERO, the name of two celebrated Greek mathematicians; the one called the old, and the other the young, Hero. The younger was a disciple of Ctesibus. They are known by two works translated into Latin by Barochius: Spiralium liber, by Hero senior; and Tractat. artis et machin. militar. by Hero junior. They flourished about 130 and 100 B. C.

HEROD the Great, was born at Ascalon in Judæa, B. C. 70. He was the son of Antipater the Idumean, who appointed him governor of Galilee. Antony made him tetrarch, and afterwards he obtained the kingdom of Judæa, which was confirmed to him by Augustus. He behaved like a savage tyrant to his subjects and to his own family. His wife, the beautiful Mariamne, her grandfather Hyrcanus, and brother Aristobulus, were all made victims to his cruelty. At the birth of our Saviour he caused all the infants of Bethlehem to be massacred, in hopes that he would fall in the number; and put to death his own sons Alexander and Aristobulus, and many other persons, so that Augustus said, "It was better to be Herod's hog than his son." However he rebuilt the temple of Jerusalem, and in a time of famine sold his curiosities to relieve the sufferers. He died miserably about two or three years after the birth of Christ, aged 70.

HEROD ANTIPAS, the son of Herod the Great, succeeded his father as tetrarch of Galilee. He divorced his wife, the daughter of Aretas king of Arabia, and espoused Herodias the wife of his brother Philip. Aretas avenged the insult by declaring war against him, in which the Jews suffered several defeats. Herod sacrificed John the Baptist to the cruelty of Herodias; and his conduct occasioned the Jews to revolt. Being called to Rome to justify his conduct, he died on the road. This is the Herod to whom Jesus Christ was sent by Pilate.

HERODIAN, a Greek historian, who flourished A. D. 247. He was a native of Alexandria, and enjoyed some office at court. He wrote a Roman history, in eight books, from the death of Marcus Aurelius to Maximinus, which is extant. The best editions are that of Politian, who also translated it into excellent Latin, 4to. 1525; and that of Oxford, 8vo. 1708.

HERODIANS, a sect among the Jews, at the time of Jesus Christ, mentioned by St. Matthew, xxii. 16. and St. Mark, iii. 6. and xii. 13.

The critics and commentators on the New Testament are very much divided with regard to the Herodians; some making them to be a political party, and others a religious sect. The former opinion is favoured by the author of the Syriac version, who calls them the domestics of Herod, and also by Josephus' having passed them over in silence, though he professes to give an account of the several religious sects of the Jews. The latter opinion is countenanced by our Lord's caution against the leaven of Herod, which implies, that the Herodians were distinguished from the other Jews by some doctrinal tenets.

Dr. Prideaux is of opinion that they derived their name from Herod the Great, and that they were distinguished from the other Jews by their concurrence with Herod's scheme of subjecting himself and his dominions to the Romans, and likewise by complying with many of their heathen usages and customs. 'This symbolizing with idolatry upon views of interest and worldly policy, was probably that leaven of Herod, against which our Saviour cautioned his disciples.' It is farther probable that they were chiefly of the sect of Sadducees; because the leaven of Herod is also denominated the leaven of the Sadducees. Prid. Conn. part ii. book v. sub. fin.

HERODOTUS, a celebrated historian of Halicarnassus. He travelled over Egypt, Italy, and all Greece. He afterwards returned to Halicarnassus, and expelled the tyrant Lydamis, which deed, far from gaining the esteem of the populace, irritated them, so that Herodotus was obliged to fly into Greece. To procure a lasting fame, he publicly repeated at the Olympic games the history which he had composed in his 39th year, B. C. 445. It was received with such universal applause, that the names of the nine Muses were unanimously given to the nine books into which it is divided. This celebrated composition, which has procured its author the title of father of history, is written in the Ionic dialect. Herodotus is among the historians what Homer is among the poets, and Demosthenes among the orators. His style abounds with elegance, ease, and sweetness. The work is an history of the wars of the Persians against the Greeks, from the age of Cyrus to the battle of Mycale in the reign of Xerxes; and, besides this, it gives an account of the most celebrated nations in the world. Plutarch has accused him of malevolence towards the Greeks. The best editions of this valuable writer are, that of Gronovius, at Leyden, in 1715; of Wesseling, folio, Amst. 1763; and that of Glasgow, 9 vol. 12mo. 1761. Mr. Beloe has given an excellent English translation of this historian.

HEROESS. See HEROINE.

HERO'IC. *a.* (from *hero.*) 1. Productive of heroes (*Shakspeare*). 2. Noble; suitable to a hero; brave; magnanimous; intrepid (*Waller*). 3. Reciting the acts of heroes (*Cowley*).

HEROIC AGE, that age or period of the world wherein the heroes are supposed to have lived.

Heroic verse, that wherein heroic poems are usually composed; or it is that proper for such poems. In the Greek and Latin, hexameter verses are usually denominated heroic verses, as being alone used by Homer, Virgil, &c.

Alexandrine verses of twelve syllables were formerly called heroic verses; but later writers use verses of ten syllables.

Heroic poem. See Epic poem.

HEROINE, a woman of an heroic spirit, or who makes the principal personage in an heroic poem.

HE'ROISM. *s.* (*heroisme*, Fr.) The qualities or character of a hero (*Broome*).

HERON, in ornithology. See Ardea.

HE'RONRY. He'ronshaw. *s.* (from *heron.*) A place where herons breed (*Der.*).

HERPES. (*herpes*, ἑρπης, from ἑρπω, to creep, because it creeps and spreads about the skin.) Serpigo. Tetters. A genus of diseases in the class locales and order dialysis of Cullen, distinguished by an assemblage of little creeping ulcers, itching very much, and not inclined to heal, but terminating in furfuraceous scales. There are two species of this disease: 1. Herpes simplex, which corresponds with the above description. 2. Herpes exedens, called also ferus and esthiomenos, which deeply corrodes the skin, and continues spreading sometimes over the abdomen or face, or where it is situated, and sometimes becomes cancerous. Herpes has been thought by many to be produced by a bilious acrimony irritating the subcutaneous glands. The remote causes are the abuse of spices, suppressed evacuations, cachexies, contagion. Herpes is sometimes critical, arising after jaundice, fever, &c. and should not be checked. The herpes exedens sometimes becomes cancerous.

HERRING, in ichthyology. See Clupea.

Herring fishery. See Fishery

Herring (Thomas), archbishop of Canterbury, was the son of a clergyman in Norfolk, and born in 1693. He received his education at the grammar school of Wisbeach, from whence he was removed to Jesus college, Cambridge. Afterwards he was elected fellow of Corpus Christi college, and was also a tutor there for several years. On entering into orders he became minister of Great Shelford. In 1722 he was appointed chaplain to Dr. Fleetwood bishop of Ely, who gave him some preferment. In 1726 he was chosen preacher to the society of Lincoln's-inn, and about the same time appointed chaplain to his majesty. In 1731 he was made dean of Rochester. In 1737 he was raised to the bishopric of Bangor, from whence in 1743 he was translated to York. In the time of the rebellion the archbishop exerted himself with great zeal in defence of the government, and gave by his example great animation to the king's friends in the north, for which he was in 1747 rewarded with the metropolitical seat of Canterbury. He died, after a long illness, in 1757, and was buried in the church of Croydon. A volume of his sermons on public occasions has been printed, and Mr. Duncombe has also published a volume of his letters.

HERRNHUT, or Herrnhuth, the first and most considerable settlement of the United Brethren, commonly called Moravians, situated in Upper Lusatia, upon an estate belonging to the family of Nicolas Lewis Count Zinzendorf, about 50 miles east of Dresden. See the article United brethren. The building of this place was began in 1727 by some emigrants from Moravia, who forsook their possessions on account of the persecution they suffered as Protestants from the Roman Catholics. It is situated upon the rise of an hill called the Hutberg, or Watch-hill, from which they took occasion to call the new settlement Herrnhut, or the Watch of the Lord. The building, increase, and admirable regulations of this settlement occasioned no small surprise in the adjacent country; and caused, in 1732, 1736, and 1737, commissioners to be appointed to examine into the doctrines and proceedings of the brethren at Herrnhut. The commissioners made a favourable report; and ever since both Herrnhut and other settlements of the United Brethren in Saxony have been protected, and even several immunities offered them by the court, but not accepted. Herrnhut was visited in 1766 by the late emperor Joseph II. after his return from Dresden, by the king of Prussia, and by several other royal personages, who expressed their satisfaction in examining its peculiar regulations. The United Brethren have settlements in Saxony, Silesia, and other parts of Germany; in Holland, Denmark, England, Ireland, and America. In England their principal settlements are at Fulnec near Leeds, and Fairfield near Manchester. In Greenland, North and South America, the West Indies, and Russia, they have missions for the propagation of Christianity among the heathens; and in many parts have had considerable success. See Busching's Account of the Rise and Progress of the Church of the Brethren, printed at Halle in 1781; and Crantz's History of the Brethren, London 1780.

HERS. *pron.* The female possessive. See Her.

HERSCHEL, the name by which several astronomers call the primary planet discovered by Dr. Herschel in March 1781. Its other names are Georgium Sidus, and Ouranus or Uranus. The planet is denoted by this character ♅, a Roman H as the initial of the name, the horizontal bar being crossed by a perpendicular line, forming a kind of cross, the emblem of Christianity, meaning thereby perhaps that its discovery was made by a Christian, or since the birth of Christ, as all the other planets were discovered long before that period.

This planet is the remotest of all those that are yet known, though not the largest, being in point of magnitude less than Saturn and Jupiter. Its light, says Dr. Herschel, is of a blueish-white colour, and its brilliancy between that of Venus and the moon. With a teles-

scope that magnifies about 300 times, it appears to have a very well defined visible disk; but with instruments of a small power, it can hardly be distinguished from a fixed star of between the sixth and seventh magnitude. In a very fine clear night, when the moon is absent, a good eye will perceive it without a telescope.

From the observations and calculations of Dr. Herschel and other astronomers, the elements and dimensions, &c. of this planet, have been collected as below.

Place of the node - -	2^s	11°	$42'$	$30''$	
Place of the aphelion in 1795	11	23	33	55	
Inclination of the orbit - . .			43	35	
Time of the perihelion passage Sep. 7, 1799.					
Eccentricity of the orbit	908 *				
Half the greater axis	19·0818	of Earth's dist.			
Revolution - - -	83¼	sidereal years			
Diameter of the planet	35107	miles			
Propor. of diam. to the earth's	4·3177	to 1			
Its bulk to the earth's	80·4926	to 1			
Its density as - -	·2204	to 1			
Its quantity of matter	17·7406	to 1			

And heavy bodies fall on its surface 18 feet 8 inches in one second of time.

Dr. Herschel has likewise discovered 6 satellites belonging to this planet. The periodical revolutions of these satellites are completed in the respective times following. I. 5d. 21h. 25m. II. 8d. 17h. 1m. 19s. III. 10d. 23h. 4m. IV. 13d. 11h. 5m. 2s. V. 38d. 1h. 49m. VI. 107d. 16h. 40m. The orbits of these satellites are very much inclined to the plane of the ecliptic; and it has been asserted that their real motion is retrograde; but this is probably an optical illusion.

HERSE. *s.* (*hersia*, low Latin.) 1. A temporary monument raised over a grave. 2. The carriage in which corpses are drawn to the grave (*Pope*).

To HERSE. *v. a.* (from the noun.) To put into a herse (*Crashaw*).

HERSE'LF. *pronoun.* 1. A female individual, as distinguished from others (*Shak.*). 2. Being in her own power; mistress of her own thoughts (*Dryden*). 3. The oblique case of the reciprocal pronoun; as, she hurt *herself*.

HERSELIKE. *a.* (*herse* and *like.*) Funeral; suitable to funerals (*Bacon*).

HERSIPHORIÆ, the same as ARREPHORIA.

HERTFORD, a town of England, and capital of the county to which it gives name, situated on the river Lea, which is navigable from the Thames, said to be a town in the time of the ancient Britons. Some of the Saxon kings resided here, and on the first division of the kingdom into counties it was made the county town; the magistracy is vested in a mayor and aldermen, burgesses, &c. There were formerly five churches, but now only two, with places of worship for Dissenters, Quakers, &c. A castle was built here in the reign of king Alfred, to stop the incursions of the Danes, who had sailed up the river Lea, as far as Ware, where they had erected a fort, to which they retired after plundering the country round about. The castle is now the seat of the marquis of Downshire. In the reign of king John the castle was taken by the barons, but recovered by king Henry III. Here is a large school for the younger children belonging to Christ's Hospital in London. Members were returned to parliament in the reign of Edward I. but in the reign of Henry V. the burgesses desired to be excused, on account of their poverty; however, two members have been returned ever since the reign of James I. Here are two markets weekly, viz. on Thursdays and Saturdays. The town contains 542 houses, and 3360 inhabitants. Lat. 51. 50 N. Lon. 0. 1 E.

In 1806 a college and school were opened here, belonging to the East India Company, and where persons are to be properly qualified for filling places of trust and importance in the civil government of India. The lectures of the professors are arranged under the heads of oriental literature, mathematics and natural philosophy, classical and general literature, law, history, and political economy. The president of the college is Dr. Samuel Henley, a man of established character and considerable erudition: and two of the professors, viz. Mr. Bridge and Mr. Dealtry, are extremely well fitted for the departments they fill. The students are habited in the costume of the Cambridge undergraduates; a circumstance which we cannot but regret, as it may often induce them to assume improper airs, and the president has no such power as the vice-chancellor and proctors of the University, to take cognizance of and punish offenders.

HERTFORDSHIRE, or HERTS, a county of England, bounded on the N. by Cambridge, on the E. by Essex, on the N. W. by Bedfordshire, on the W. by Bucks, and on the S. by Middlesex. It is 36 miles long from N. to S. and 28 broad from E. to W. It is divided into eight hundreds, which contain 19 market towns, and 174 parishes, and sends six members to parliament. The northern skirts of this county are hilly, forming a scattered part of the chalky ridge which extends across the kingdom in this direction. A number of streams take their rise from this side, which, by their clearness, show the general nature of the soil to be inclined to hardness, and not abundantly rich. Flint stones are scattered in great profusion over the face of this county; and beds of chalk are frequently to be met with. It is found, however, with the aid of proper culture, to be extremely favourable to corn, both wheat and barley, which come to as great perfection here as in any part of the kingdom. The western part is, in general, a tolerably rich soil, and under excellent cultivation. Indeed, the traffic of the county is in corn and malt. The air is wholesome; and the principal rivers are the Lea, Stort, and Coln. The county contains about 451,000 acres of land, about 4500 of which are uncultivated, including woodlands. There were, in 1801, 18,172 houses, and 97,577

inhabitants. It then furnished 460 men to the national militia.

HERVEY (James), a pious and ingenious English divine, was the son of a clergyman at Hardingstone in Northamptonshire, where he was born in 1714. He received his academical education at the grammar school of Northampton, and was removed from thence to Lincoln college, Oxford, where he had for his tutor the celebrated Mr. John Wesley. In 1736 he became curate to his father, who had then the living of Weston Favell, and soon afterwards went to Bideford in Devonshire, where he was greatly beloved by the parishioners. In 1743 the old rector dying, and a a new one being presented, Mr. Hervey was removed from the curacy to the great grief of the inhabitants, who offered to pay his salary themselves if the rector would permit him to remain. This being refused, he returned to his father, whom he succeeded in his livings of Weston and Collingtree. In 1746 he published his Meditations among the Tombs, and Reflections in a Flower Garden, which being well received he added another volume, and they both are too generally known and admired to need encomium here. In 1755 he published his Theron and Aspasion, or a Series of Dialogues and Letters on the most important Subjects, in 3 vols. 8vo. This work, in respect of language and argument, rises far superior to the Meditations. The author's grand object is to prove the total ruin of mankind by the fall, and their restoration by the imputation of Christ's righteousness. Several writers attacked his doctrine, and among the rest Mr. John Wesley, to whom Mr. Hervey replied in a series of letters, which were published after his death. As his works had a great sale, his profits were large, but he gave the whole away to charitable purposes. This eminently pious and good man died on Christmas-day, 1758, after a lingering consumption, which he bore with all the fortitude and submission to the divine will, which genuine christianity can inspire. Besides the above performances, he printed Reflections on Lord Bolingbroke's Letters on the Study and Use of History, and several single Sermons. All his works were printed in 7 vols. 8vo. 1796.

Of the piety of this excellent man, and the great usefulness of many of his writings, there cannot be two opinions. His erudition was respectable; but his taste was extremely ill formed; and his style is, therefore, very inflated, diffuse, and flowery. (See FLORID.) He was, however, a man of genius as well as of piety; and our language must undergo considerable mutations before his publications can sink into neglect.

To HERY. *v. a.* (herian, Saxon.) To regard as holy; not in use (*Spenser*).

HESBON, ESEBON, or HESEBON, in ancient geography, the royal city of the Amorites, in the tribe of Reuben, according to Moses: though in Joshua xxi. 39. where it is reckoned among the Levitical cities, it is put in the tribe of Gad; which argues its situation to be on the confines of both.

HESDIN, a strong town of France, in the department of the Straits of Calais and late county of Artois. Lat. 50. 24 N. Lon. 2. 6 E.

HESIOD, a celebrated poet, born at Ascra in Bœotia, son of Dius, and Pycimede. He lived in the age of Homer, and even obtained a poetical prize in competition with him, according to Varro and Plutarch. Quintilian and others maintain, that Hesiod lived before the age of Homer; but Val. Paterculus, &c. support that he flourished about 100 years after him. Hesiod is the first who wrote a poem on agriculture. This composition is called The Works and the Days. His Theogony is a miscellaneous narration executed without art or precision, and his Shield of Hercules but a fragment of a larger poem. Hesiod, without being master of the fire and sublimity of Homer, is admired for the elegance of his diction and the sweetness of his poetry. Virgil, in his Georgics, has imitated the compositions of Hesiod, and taken his opera and dies for model. The Greeks were so partial to his poetry and moral instructions, that they ordered their children to learn all by heart. If Hesiod flourished in the age of Homer he probably lived 907. B. C.

A good edition of Hesiod's works was published at Amsterdam by Le Clerc, in 1701. They have been done into English by Thomas Cooke; and the Remains of Hesiod have been just translated into English verse by C. A. Elton.

Lucian has left us a little dialogue between Hesiod and himself, wherein he jeers him, because he boasted of his commerce with the Muses.

"*Lucian.* Your verses, Hesiod, sufficiently evince you a great poet, for all you write is noble and lofty, and we easily perceive you have received a branch of laurel from the Muses' hands. But you having said that this divine present would teach things past and future, I would fain know, why having descanted on the one, you have told us nothing of the other; for you have sung the geneology of the gods, beginning from the heaven and earth, the chaos and love; you have afterwards set down the precepts of astrology for sailors and husbandmen; you have treated of rural life, of women's virtues, and other such like matters; but you have not hazarded so much as one word of futurity, which had better manifested your inspiration, and redounded more to the advantage of men. Is it that you imposed upon us? or are you willing to conceal your secret? or else are not your prophecies transmitted down to us? for there is no likelihood that the Muses should keep but that part of their promise, and neglect to teach you futurity, which was the main thing.

"*Hesiod.* It is easy to answer you, that having said nothing but by the inspiration of the Muses, 'tis to them to give you an account

*of their actions; but if you desire to know something of my calling, I will tell you what I know of agriculture. As the gods reveal themselves to whom they please, so they reveal only what they please, and have not taught me the least of what you desire to know. Moreover, an historical truth is not expected from poets, nor a reason asked them of all their fictions; besides, they are used to add many things, for the filling up the measure of their verses, or to cause the more admiration; for if you should retrench them of this liberty, you would curb their genius. But without taking notice of the beauty of invention and expression, which are the principal talents, you make it your business to cavil at the words, as you would do with those of a contract; which is the sign of a carping, quirking wit. I forbear to mention, that you will find in my poem entitled The Works and Days several predictions, which I bestow on those who are good and bad husbandmen."

HE'SITANCY. *s.* (from *hesitate.*) Dubiousness; uncertainty; suspence (*Atterb.*).

To HE'SITATE. *v. a.* (*hæsito*, Latin.). To be doubtful; to delay; to pause (*Pope*).

HESITA'TION. *s.* (from *hesitate.*) 1. Doubt; uncertainty; difficulty made. 2. Intermission of speech; want of volubility (*Swift*).

HESPER, in astronomy. See HESPERUS.

HESPERIA, an ancient name of Italy, as well as of Spain.

HESPERIA. In entomology, a tribe of the genus papilis upon the Fabrician system. See PAPILIO.

HESPERI'DEÆ. The name of the forty-first order in Linnéus's Fragments of a Natural Method; containing only three genera, citrus, styrax, garcinia.

HESPERIDES, three celebrated nymphs, daughters of Hesperus. They were appointed to guard the golden apples which Juno gave to Jupiter on the day of their nuptials, and the place of their residence placed beyond the ocean by Hesiod, is more universally believed to be near mount Atlas in Africa, according to Apollodorus. This celebrated garden abounded with fruits of the most delicious kind, and was carefully guarded by a dreadful dragon which never slept. It was one of the labours of Herculus to procure some of the golden apples of the Hesperides, which he did, as some mythologists assert, by having previously killed the watchful dragon that guarded the fruit. This monster was supposed to be the offspring of Typhon, and to have had a hundred heads and as many voices. Those that attempt to explain mythology observe, that the Hesperides were certain persons who had an immense number of flocks, and that the ambiguous word μηλον, which signifies an apple and a sheep, gave rise to the fable of the golden apples of the Hesperides.

HESPERIS. Rocket-violet. Dame's-violet. In botany, a genus of the class tetradynamia, [illegible]. Petals bent obliquely; gland [illegible] each of the shorter [illegible]; silique [illegible] closed; two of the leaves gibbous at the base. Ten species, chiefly natives of the south of Europe: one, H. inodora, common to the pastures of our own country. Of the rest we shall notice the following.

1. H. histis. Pale mountain rocket. Stem bristly, branched, spreading.

2. H. matronalis. Garden rocket. Stem simple, erect; leaves ovate, lanceolate, denticulate; petals emarginate with a point.

3. H. verna. Stem erect, branched; leaves heartshaped, clasping the stem, serrate, villous.

The first and second species are biennial plants; the first grows naturally in Hungary, and is much cultivated in the gardens abroad for the fragrancy of its flowers, though it is rarely seen in our English gardens. The second, which is a native of Italy, was formerly in greater abundance in English gardens than at present. Of this there is a variety with double flowers, much esteemed for its beauty, and much cultivated in our gardens. These sorts are propagated by seeds, which, if they be permitted to scatter, the plants will come up without any trouble in the spring; and if the seeds be sown, the best season is the autumn, because those sown in the spring will often fail, if the season prove dry, or will remain a long time in the ground before they vegetate. The plants require a loamy, undunged soil. The last species is a native of France, and propagated by sowing the seeds in autumn, in the same manner as the other species.

HESPERUS, a son of Japetus, brother to Atlas. He came to Italy, and the country received the name of Hesperia from him, according to some accounts. (*Vid.* HESPERIDES.) *Diod.*—The name of Hesperus was also applied to the planet Venus, when it appeared after the setting of the sun. It was called Phosphorus or Lucifer when it preceded the sun.

HESSE, a country of Germany, in the circle of the Upper Rhine; bounded on the N. by the bishopric of Paderborn, and duchy of Brunswick; on the E. by Thuringia; on the S. by Fulde, and Wetteravia; and on the W. by the counties of Nassau, Witgenstein, Hatzfelt, and Weldeck. It is about 100 miles long, and 50 broad. The house of Hesse is divided into four branches; namely, Hesse-Cassel, Hormburg, Darmstadt, and Rheinfeld; each of these has the title of Landgrave, and takes its name from one of the four principal towns.

HESSIAN FLY. See TENTHREDO.

HEST. *s.* (hæpt, Saxon.) Command; precept; injunction; obsolete (*Shakspeare*).

HESYCHYASTIC, in music, a term by which the ancients expressed that mixed mode or scale of sounds, which consisted partly of sharp, and partly of flat intervals (*Busby*).

HETERIARCH, in antiquity, an officer in the Greek empire, whose principal function was to command the troops of the allies.

HETEROCLITE. *s.* (*heteroclitum*, Lat.)

1. Such nouns as vary from the common forms of declension (*Watts*). 2. Any thing or person deviating from the common rule.

HETEROCLI'TICAL. *a.* (from *heteroclite*.) Deviating from the common rule (*Brown*).

HETERODOX. *a.* (ἕτερος and δόξα.) Deviating from the established opinion; not orthodox (*Locke*).

He'terodox. *s.* An opinion peculiar (*Brown*).

HETEROGE'NEAL. *a.* (*heterogene*, Fr. ἕτερος and γένος.) Not of the same nature; not kindred (*Newton*).

HETEROGENE'ITY. *s.* (from *heterogeneous*.) 1. Opposition of nature; contrariety or dissimilitude of qualities. 2. Opposite or dissimilar part (*Boyle*).

HETEROGE'NEOUS. *a.* (ἕτερος and γένος.) Not kindred; opposite or dissimilar in nature (*Woodward*).

Heterogeneous bodies, are such as have their parts of unequal density.

Heterogeneous light, is by sir Isaac Newton said to be that which consists of rays of different degrees of refrangibility.

Heterogeneous quantities, are those which are of such different kind and consideration, as that one of them, taken any number of times, never equals or exceeds the other.

Heterogeneous surds, are such as have different radical signs; as, $\sqrt{aa}$, and $\sqrt[3]{bb}$; $\sqrt[5]{9}$, and $\sqrt[7]{19}$.

HETEROSCII, in geography, are such inhabitants of the earth as have their shadows at noon projected always the same way with regard to themselves, or always contrary ways with respect to each other. Thus, all the inhabitants without the torrid zone are Heteroscii, with regard to themselves, since any one such inhabitant has his shadow at noon always the same way, viz. always north of him in north latitude, and always south of him in south latitude; or these two situations are Heteroscii to each other, having such shadows projected contrary ways at all times of the year.

HETEROSPERMUM. In botany, a genus of the class syngenesia, order polygamia superflua. Receptacle naked; seeds of the margin compressed, with a membraneous edge; inner ones oblong, two-awned; calyx double; outer one four-parted; inner one many-leaved. Two species: natives of Spanish America.

HETH, the father of the Hittites, was the eldest son of Canaan (Gen. x. 15).

HETRURIA, and Etruria, a celebrated country of Italy, at the west of the Tyber. It originally contained twelve different nations, which had each their respective monarch.

HEVÆI, in ancient geography, one of the seven people who occupied Canaan; a principal and numerous people, and the same with the Kadmonæi, dwelling at the foot of Hermon and partly of Libanus, or between Libanus and Hermon (Judges iii. 3.)

HEUCHERA. In botany, a genus of the class pentandria, order digynia. Petals five; capsule two leaved, two-celled. One species, a native of Virginia, with panicled flowers.

HEVELIUS (John), a famous astronomer, was born at Dantzic, in 1611, of a distinguished family. His education was extensively liberal, but his chief turn was to the mathematics. Astronomy fixed his attention most, and he built an observatory for the purpose of making accurate observations; the result of which he published in 1647, under the title of Selenographia, sive Lunæ descriptio, &c. to which he added the phases of the other planets as observed by the telescope. This work was followed by many others, the most distinguished of which was his Cometographia, published in 1668. He sent a copy of this book to our Dr. Hooke; and it is observable that the present occasioned a controversy between those two great men on this point: "Whether distances and altitudes could be taken with plain sights nearer than to a minute," which Hooke denied, and Hevelius maintained. Though the affair was philosophical, the parties did not manage it so, but expressed themselves with considerable warmth, and enmity against each other. Hevelius died at Dantzic in 1687, after having been appointed burgomaster of that city. His works are very numerous, but the greatest is that entitled, Machina Cœlestis, in two parts (*Watkins*).

To HEW. *v. a.* part. *hewn* or *hewed*. (heapan, Saxon.) 1. To cut by blows with an edged instrument; to hack (*Hayward*). 2. To chop; to cut (*Dryden*). 3. To fell, as with an axe (*Sandys*). 4. To form or shape with an axe (*Addison*). 5. To form laboriously (*Dryden*).

HE'WER. *s.* (from *hew*.) One whose employment is to cut wood or stone (*Brown*).

HEXACHORD, compounded of ἕξ, *six*, and χορδὴ, *chord*, or *string*, in the ancient music, a concord commonly called by the moderns a *sixth*. The hexachord is two-fold, the major, and the minor: the former is expressed in numbers by the ratio of 3 : 5; the latter by that of 5 : 8.

HEXAEDRON, or Hexahedron, one of the five regular or Platonic bodies; being indeed the same as the cube; and so called from its having six faces.—The square of the side or edge of a hexahedron, is one-third of the square of the diameter of the circumscribing sphere; and hence the diameter of a sphere is to the side of its inscribed hexahedron, as $\sqrt{3}$ to 1.

In general, if A, B, and C, be put to denote respectively the linear side, the surface, and the solidity of a hexahedron, or cube, also r the radius of the inscribed sphere, and R the radius of the circumscribed one; then we have these general equations or relations:

1. $A = 2r = \frac{2}{3}R\sqrt{3} = \sqrt{\frac{1}{6}B}$
$= \sqrt[3]{C}$.

2. $B = 24r^2 = 8R^2 = 6A^2$
$= 6\sqrt[3]{C^2}$.

$$3.\ C = 8r^3 = \tfrac{4}{9}R\sqrt[3]{3} = A^3 = \tfrac{1}{7}B\sqrt{\tfrac{1}{6}B}.$$
$$4.\ R = r\sqrt{3} = A\ 3 = \tfrac{1}{2}\sqrt{\tfrac{1}{4}B} = \tfrac{1}{2}\sqrt{3}\times\sqrt[3]{C}.$$
$$5.\ r = \tfrac{1}{2}R\sqrt{3} = \tfrac{1}{2}A = \tfrac{1}{2}\sqrt{\tfrac{1}{6}B} = \tfrac{1}{2}\sqrt[3]{C}.$$

HEXAGON, in geometry, a figure of six sides and angles; and if these sides and angles be equal, it is called a regular hexagon.

The side of every regular or equilateral hexagon, inscribed in a circle, is equal in length to the radius of that circle. Hence, it is easy, by laying off the radius six times upon the circumference, to inscribe an hexagon in a circle.

The square of the side of a regular hexagon multiplied into the number 2·5980762, will give the area.

HEXAGON, in fortification, is a six-lined figure defended by six bastions.

HEXA'GONAL. *a.* (from *hexagon.*) Having six sides or corners (*Brown*).

HEXA'GONY. *s.* (from *hexagon.*) A figure of six angles (*Bramhall*).

HEXAGY'NIA. (εξ, *six*, and γυνη, *a woman.*) In botany, one of the orders in the ninth and thirteenth classes of the Linnéan system; containing those plants which have six styles in the flowers.

HEXA'METER, in ancient poetry, a kind of verse consisting of six feet; the first four of which may be indifferently, either spondees or dactyls; the fifth is generally a dactyl, and the sixth always a spondee. Such is the following verse of Horace:

1	2	3	4	5	6
Aut pro	*desse vo*	*lunt, au*	*delec*	*tare po*	*etæ.*

HEXAMILION, HEXAMILI, or HEXAMILIUM, a celebrated wall, built by the emperor Emanuel in 1413 over the isthmus of Corinth. It took its name from εξ, *six*, and μιλιον, which in the vulgar Greek signifies a *mile*, as being six miles long. The design of the hexamilion was to defend Peloponnesus from the incursions of the barbarians.

HEXANDRIA. (εξ, and ανηρ, *a man* or *husband.*) In botany, the name of the sixth class in Linnéus's system; comprehending those plants which have hermaphrodite flowers with six equal stamens. This is a natural class, nearly the same with the lilia or liliaceous plants of other writers; and contains a great part of the sixth, ninth, tenth, and eleventh orders, in Linnéus's Natural Arrangement, with an admixture of some others.

HEXAPETALOUS COROL. In botany, a corol consisting of six distinct petals.

HEXAPETALOID COROL. In botany, divided so near to the base as to have the appearance of a six-petalled corol, but in reality one-petalled, as in agapanthus.

HEXAPHYLLOUS CALYX. In botany, a calyx of six leaves or leaflets.

HEXAPLA, formed of εξ, *six*, and απλοω, *I open, I unfold*: in church-history, a bible disposed in six columns; containing the text, and divers versions thereof, compiled and published by Origen, with a view of securing the sacred text from future corruptions, and to correct those that had been already introduced.

Eusebius, Hist. Eccl. lib. vi. cap. 16. relates, that Origen, after his return from Rome under Caracalla, applied himself to learn Hebrew, and began to collect the several versions that had been made of the sacred writings, and of these to compose his Tetrapla and Hexapla: others, however, will not allow him to have begun till the time of Alexander, after he had retired into Palestine, about the year 231.

To conceive what this Hexapla was, it must be observed, that, besides the translation of the sacred writings, called the Septuagint, made under Ptolemy Philadelphus, above 280 years before Christ, the scripture had been since translated into Greek by other interpreters. The first of those versions, or (reckoning the Septuagint) the second, was that of Aquila, a proselyte Jew, the first edition of which he published in the twelfth year of the emperor Adrian, or about the year of Christ 128; the third was that of Symmachus, published, as is commonly supposed, under Marcus Aurelius, but, as some say, under Septimus Severus, about the year 200; the fourth was that of Theodotion, prior to that of Symmachus, under Commodus, or about the year 175: these Greek versions, says Dr. Kennicott, were made by the Jews from their corrupted copies of the Hebrew, and were designed to stand in the place of the Seventy, against which they were prejudiced, because it seemed to favour the Christians. The fifth was found at Jericho, in the reign of Caracalla, about the year 217; and the sixth was discovered at Nicopolis, in the reign of Alexander Severus, about the year 228: lastly, Origen himself recovered part of a seventh, containing only the Psalms.

Now Origen, who had held frequent disputations with the Jews in Egypt and Palestine, observing, that they always objected against those passages of Scripture quoted against them, and appealed to the Hebrew text; the better to vindicate those passages, and confound the Jews, by shewing that the Seventy had given the sense of the Hebrew; or rather, to shew, by a number of different versions, what the real sense of the Hebrew was; undertook to reduce all these several versions into a body, along with the Hebrew text, so as they might be easily confronted, and afford a mutual light to each other.

He made the Hebrew text his standard; and allowing that corruptions might have happened, and that the old Hebrew copies might and did read differently, he contented himself with marking such words or sentences as were not in his Hebrew text, nor the later Greek versions, and adding such words or sentences as were omitted in the Seventy, prefixing an asterisk to the additions, and an obelisk to the others.

In order to this, he made choice of eight

columns: in the first he gave the Hebrew text in Hebrew characters; in the second, the same text in Greek characters; the rest were filled with the several versions above mentioned; all the columns answering verse for verse, and phrase for phrase; and in the Psalms there was a ninth column for the seventh version.

This celebrated work perished with the library at Cesarea, in the year 653.

HE'XAPOD. *s.* (ἑξ and ποδὸς.) An animal with six feet (*Ray*).

HEXAS'TICH. *s.* (ἑξ and στίχος.) A poem of six lines.

HEXASTYLE, in ancient architecture, a building with six columns in front.

HEXHAM, a town in Northumberland, with a market on Tuesdays. It was formerly famous for its abbey, built in the beginning of the twelfth century. Hexham was erected into a bishopric in 675, but in 874 the see was united to Lindisfarn, and afterwards to that of York. Near this place, in 1463, was fought a battle, between the houses of York and Lancaster, in which the latter was defeated. Hexham contains about 2000 inhabitants. Lat. 55. 3 N. Lon. 2. 1 W.

HEXIS. (ἕξις, from ἔχω, to have.) In medicine, habit or constitution. It is a frequent termination in compound words; as cachexis or cachexy, an ill-habit, &c.

HEXODON. In entomology, a tribe of the genus Scarabæus, upon the Fabrician system. See SCARABÆUS.

HEY. *interj.* (from *high.*) An expression of joy, or mutual exhortation (*Prior*).

HE'YDAY. *interj.* (for *high day.*) An expression of frolick and exultation (*Hudibras*).

HE'YDAY. *s.* A frolick; wildness (*Shakspeare*).

HE'YDEGIVES. *s.* A wild frolick dance (*Spenser*).

HEYDEN (John van der), an eminent landscape-painter, born at Gorcum in 1637, and died in 1712. He was not only distinguished in painting landscapes, but also representations of buildings, which he executed according to the justest rules of perspective.

HEYDON, a borough in the E. riding of Yorkshire, with a market on Thursdays. It was formerly a considerable town, but is now much decayed. Lat. 53. 45 N. Lon. 0. 5 W.

HEYLYN (Peter), a learned English divine, was born at Burford in Oxfordshire in 1600, and educated at Hart-hall, Oxford, but afterwards obtained a fellowship of Magdalen college, where he read cosmographical lectures, then a novelty in that university. In 1621 he published his Description of the World, which was so well received that he greatly enlarged it, and gave it the name of Cosmography. In 1628 he was appointed chaplain in ordinary to the king, and in 1631 obtained a prebendal stall in Westminster-abbey, which was followed by the valuable living of Houghton in the diocese of Durham. In 1633 he took his degree of D.D. and in 1637 was chosen treasurer of the church of Westminster. He also obtained some other preferments, of all which he was deprived by the parliament, and was besides voted a delinquent, by which his goods were confiscated, and his person endangered. He kept removing about incognito for some years, still, however, employing his pen against the prevailing party. At the Restoration he was restored to his prebend, and died in 1662. He was a man of vast abilities, and a smart and intelligent writer; but it must be confessed he was not always impartial, and sometimes he carried his notions to an unwarrantable pitch. His works are too numerous to be mentioned in this place.

HEYTESBURY, a borough in Wiltshire, that sends two members to parliament, but has now no market. Lat. 51. 12 N. Lon. 2. 8 W.

HEYWOOD (John), an English poet and wit, was born at London, and bred at Oxford. He is one of the first who wrote plays in our language, and is said also to have been well skilled in music. He was a great favourite with Henry VIII. and was equally so with queen Mary, on account of his extreme liveliness and humour. On the accession of Elizabeth he went to Mechlin in Brabant, and died there in 1565. He wrote several plays; but one of his principal performances is, The Spider and Fly, a parable, in 4to. 1596, in which his portrait very frequently occurs, cut in wood.

HIATION. *s.* (from *hio*, Latin.) The act of gaping (*Brown*).

HIATUS, a Latin term, properly signifying the aperture of the mouth, from the verb *hiare*, to gape.

It is variously used, in works of literature, &c. to denote a chasm or gap; particularly in verses, where there is a clashing of vowels, by one word ending with a vowel, and the following one beginning with another: as in,

—Tho' oft the ear the open vowels tire.

This clashing of vowels, so disagreeable to the ear, is called a hiatus in prose as well as verse.

Hiatus is also used for a defect in a manuscript copy, where something is lost or effaced by the injuries of time or otherwise.

HIBE'RNAL. *a.* (*hibernus*, Latin.) Belonging to the winter (*Brown*).

HIBISCUS. Syrian mallow. In botany, a genus of the class monadelphia, order polyandria. Calyx double; the outermost generally many-leaved; stigmas five; capsule five-celled, many-seeded. Sixty-six species: chiefly of the East and West Indies, America, and the Cape of Good Hope. The following are principally worthy of notice.

1. H. elatus. Leaves hearted, roundish, very entire, hoary, downy underneath with a single pore; peduncle very short, bearing a single flower, large, of purplish-saffron hue; with a ten-toothed outer calyx. A Jamaica tree from fifty to sixty feet high.

2. H. rosa cinensis. Chinese rose. Leaves ovate, pointed, toothed, glabrous, very entire

at the base; stem arboreous; outer calyx from five to eight-leaved. A native of the East Indies.

3. H. Phœnicus. Leaves ovate, pointed, serrate; the lower ones somewhat hearted, and tricuspidate; peduncles jointed; seeds woolly. A small East Indian shrub, with beautifully scarlet flowers.

4. H. mutabilis. Leaves hearted, angular, five-lobed, pointed, toothed; outer calyx eight-leaved; capsule villous. Stem arboreous, rising to twelve or fourteen feet. The flowers are large, white in the morning, pale flesh-colour in the middle of the day, rosy in the evening; and fall off at sun-set. It is a native of India; but in our own climate the flowers neither change nor fall off so rapidly.

5. H. Syriacus. Althæa frutex. Leaves wedge-ovate, three-lobed, toothed; outer calyx from six to eight-leaved, as long as the inner one; stem arboreous.

6. H. Abelmoschus. Musk-mallow. Leaves somewhat peltate, and hearted, seven-angled, pointed, serrate; outer calyx about eight-leaved; stem bristly. A native of India, with large seeds, and a very strong musky odour.

7. H. tiliaceus. Maho-tree. Leaves roundish, hearted, pointed, crenate; stem arboreous; outer calyx ten-toothed: a native of India, with pale yellow flowers, terminal, in long spikes.

8. H. esculentus. Eatable hibiscus. Leaves heart-shaped, five-lobed, rather obtuse, toothed; petioles longer than the flower; outer calyx ten or twelve-parted, deciduous; inner one bursting longitudinally, and discharging a number of heart-shaped seeds, which are cut and dried when gathered green, and used as spices in soups and other culinary preparations.

Many of these are common to our own gardens and green-houses; and in general propagated without much trouble.

HICCIUS DOCCIUS. *s.* A cant word for a juggler; one that plays fast and loose (*Hudibras*).

HICCORY-NUT TREE. See JUGLANS.

HICCOUGH, or HICKUP. See MEDICINE.

To HICCO'UGH. *v. n.* (from the noun.) To sob with convulsion of the stomach.

To HI'CKUP. *v. n.* (corrupted from *hiccough*.) To sob with a convulsed stomach (*Hudibras*).

HICKES (George), a learned divine, was born in 1642, at Newsham in Yorkshire, and educated at the school of North Allerton, from whence he removed to St. John's college, Oxford; but he afterwards became fellow of Lincoln, and took there his degree of M. A. He accompanied his pupil, sir George Wheeler, on his travels; but proceeded no further than France, where he contracted an intimacy with Mr. Henry Justel. In 1676 he became chaplain to the duke of Lauderdale, whom he attended to Scotland when his grace was appointed high commissioner of that kingdom. While at St. Andrew's he was honoured with the degree of D. D. which was confirmed to him by the university of Oxford in 1679. In 1683 he was made dean of Worcester, of which he was deprived at the Revolution for refusing the oaths. The deprived bishops having consulted about preserving the episcopal succession among the non-jurors, recommended Dr. Hickes to king James, and he accordingly waited on that monarch in France, who confirmed their proceedings, and the doctor was accordingly consecrated suffragan bishop of Thetford. Hickes was a man of strong mind, great resolution, and vast abilities. He died in 1715. He wrote several theological treatises, mostly polemical; but his chief works are some Latin books on the northern languages and antiquities. His sermons are close and argumentative, and full of excellent learning well applied.

HIDAGE, HIDAGIUM, was an extraordinary tax payable to the kings of England for every hide of land.

HIDALGO, in modern history, a title given in Spain to all who are of a noble family.

To HIDE. *v. a.* preter, *hid*; part. pass. *hid* or *hidden*. (hȳdan, Sax.) To conceal; to withhold or withdraw from sight or knowledge (*Shakspeare*).

To HIDE. *v. n.* To lie hid; to be concealed (*Pope*).

HIDE AND SEEK. *s.* A play in which some hide themselves and another seeks them (*Swift*).

HIDE. *s.* (hȳðe, Saxon, *haude*, Dutch.) 1. The skin of any animal, either raw or dressed (*Pope*). 2. The human skin: in contempt (*Dryden*).

HIDE OF LAND, such a quantity as might be ploughed in the compass of a year by one plough; some call it 60, some 80, and others 100 acres.

HIDE-BOUND, in the manage, a disease among horses supposed to proceed from coarse diet, or undue exertion. The horse in such case has the appearance of being emaciated; his coat is of a dingy variegated hue, staring different ways, with a scurvy dust underneath; his skin is of an unpliable rigidity, seeming to adhere closely to the internal parts, denoting a deficiency of the fluids, an obstruction of the porous system, and a languor in the circulation.

Nothing will produce this disease sooner than hard work with bad keep, and a constant exposure to all weathers, in the severity of the winter season. Musty oats, mouldy hay, and winter straw-yards, are also frequent causes: good stable-discipline, however, in wisping and dressing, regular daily exercise, a few mashes nightly of ground malt and bran in equal parts, followed by a cordial ball every morning, or an antimonial alterative powder nightly in the mash, will soon restore the horse to good condition.

By way of metaphor, we sometimes hear of a *hidebound* pedant, or of a *hidebound* miser.

HIDEGILD, in the laws of king Canute,

the price paid by a servant to save his skin a whipping.

HI'DEOUS. *a.* (from *hideux*, French.) Horrible; dreadful; shocking (*Woodward*).

HI'DEOUSLY. *ad.* Horribly; dreadfully; in a manner that shocks (*Shakspeare*).

HI'DEOUSNESS. *s.* (from *hideous*.) Horribleness; dreadfulness; terrour.

HI'DER. *s.* (from the verb.) He that hides.

HIDROGEN. See HYDROGEN.

HIDROA. (ἱδρωα, from ἱδρως, sweat.) Pustules produced by sweating in hot weather.

To HIE. *v. n.* (hiegan, Saxon.) To hasten; to go in haste (*Dryden*).

HIERACIUM. Hawk-weed. In botany, a genus of the class syngenesia, order polygamia æqualis. Receptacle mostly naked, dotted; calyx imbricate, ovate; down simple, sessile. Sixty-nine species: mostly natives of Europe, a few of America: ten indigenous to the woods, shades, or mountains, of our own country. They may be thus subdivided:

A. Scape with a single flower.

B. Scape many-flowered.

C. Stem leafy.

The two most common in our own country are,

1. H. pilosella, found in our pastures, and known by the name of mouse-ear.

2. H. aurantiacum, more frequently met with in Scotland, and vulgarly denominated Grim the collier.

The most beautiful sorts of this genus, and those most worth cultivating in the gardens, have perennial roots, and may be propagated by seeds, sown in March upon a border with an aspect to the east. The plants must be kept clean from weeds; and, when strong enough to be removed, which they will be about the beginning of June, should be transplanted into a shady border of undunged ground, at the distance of six inches asunder. If the weather prove dry, let them be watered till they have taken new root; after which, if kept clean from weeds, they will require no other culture. In the autumn they should be transplanted where they are designed to remain: the following summer they will flower, and produce ripe seeds; and the roots will continue some years, if not planted in a rich or moist soil. They may be also propagated by offsets, or parting of the roots, in autumn. See Pl. CXXXV.

HIERAPOLIS, in ancient geography, a town of Phrygia, abounding in hot springs, and having its name from the number of its temples. It is now called Pambouk; and is situated near the Scamander, on a portion of Mount Mesogis, distant six miles from Laodicea. Its situation is very romantic.

HI'ERARCH. *s.* (ἱερος and αρχη.) The chief of a sacred order (*Milton*).

HIERA'RCHICAL. *a.* (*hierarchique*, Fr.) Belonging to sacred or ecclesiastical government.

HI'ERARCHY. *s.* (*hierarchie*, Fr.) 1. A sacred government; rank or subordination of holy beings (*Fairfax*). 2. Ecclesiastical government (*South*).

HIERATIC PAPER, in antiquity, the finest paper, set apart for religious purposes.

HIERES, a town of France, in the department of Var, and late province of Provence. It was formerly a seaport town, where pilgrims bound for the Holy Land used to embark, but the sea is now retired to a considerable distance from the town. It is situated in a delightful country, and fine climate. Lat. 43. 5 N. Lon. 6. 20 E. This town is the birth-place of Massillon.

HIERES ISLANDS, a cluster of small islands in the Mediterranean, near the coast of France, which take their name from the town of Hieres. They are particularly celebrated for the great variety of medicinal plants on them. Lat. 43. 2 N. Lon. 6. 28 E.

HIERO I. king of Syracuse, succeeded his brother Gelon B. C. 478. He declared war against Theron the tyrant of Agrigentum, and took Himera. He gained three crowns at the Olympic games (two in horse races, and one in a chariot race,) for which he is celebrated by Pindar. The conversation of that bard and other eminent men softened his disposition, which was naturally impetuous, and rendered him humane and liberal. He died B. C. 467.

HIERO II. king of Syracuse, was a prince of great virtues. He was a descendant of Gelon, and elected king B. C. 268. He carried on a war against the Romans for some time, in conjunction with the Carthaginians, but he was soon obliged to make peace, and ever after continued a firm ally of that people. He was the relation and friend of Archimedes, and greatly encouraged arts and commerce. He died regretted by all his subjects, B. C. 225.

HIEROCLES. The most remarkable of this name were, 1 a great persecutor of the Christians under Dioclesian; and, 2. a Platonic philosopher, who taught at Alexandria, and wrote a book on providence and fate, fragments of which are preserved by Photius; a commentary on the golden verses of Pythagoras; and facetious moral verses. He flourished A. D. 485.

HIEROGLYPHICS, in antiquity, mystical characters, or symbols, in use among the Egyptians, and that as well in their writings as inscriptions; being the figures of various animals, the parts of human bodies, and mechanical instruments. The word is composed of the Greek ἱερος, *sacer*, holy, and γλυφειν, *sculpere*, to engrave; it being the custom to have the walls, doors, &c. of their temples, obelisks, &c. engraven with such figures. Hieroglyphics are properly emblems or signs of divine, sacred, or supernatural things, by which they are distinguished from common symbols, which are signs of sensible and natural things. Hermes Trismegistus is commonly esteemed the inventor of hieroglyphics he first introduced them into the heathen theology, from whence they have been transplanted into the Jewish and Christian. Sacred

things, says Hippocrates, should only be communicated to sacred persons. Hence it was that the ancient Egyptians communicated to none but their kings and priests, and those who were to succeed to the priesthood and the crown, the secrets of nature, and the secrets of their morality and history; and this they did by a kind of cabbala, which, at the same time that it instructed them, only amused the rest of the people. Hence the use of hieroglyphics, or mystic figures, to veil their morality, politics, &c. from profane eyes. This author, it may be observed, and many others, do not keep to the precise character of a hieroglyphic, but apply it to profane as well as divine things.

Hieroglyphics are a kind of real characters, which do not only denote, but in some measure express, the things. Thus, according to Clemens Alexandrinus, Strom. v. a lion is the hieroglyphic of strength and fortitude; a bullock, of agriculture; a horse, of liberty; a sphinx, of subtilty, &c.

Such is the opinion that has generally been embraced, both by ancient and modern writers, of the origin and use of hieroglyphics. It has been almost uniformly maintained, that they were invented by the Egyptian priests in order to conceal their wisdom from the knowledge of the vulgar; but the late bishop Warburton hath, with much ingenuity and learning, endeavoured to shew that this account is erroneous.

According to this writer, the first kind of hieroglyphics were mere pictures, because the most natural way of communicating our conceptions by marks or figures was by tracing out the images of things; and this is actually verified in the case of the Mexicans, whose only method of writing their laws and history was by this picture-writing. But the hieroglyphics invented by the Egyptians were an improvement on this rude and inconvenient essay towards writing, for they contrived to make them both pictures and characters.

HIEROGLY'PHICAL, Hierogly'phic. *a.* (*hieroglyphique*, Fr.) Emblematical; expressive of some meaning beyond what immediately appears (*Sandys*).

HIEROGLY'PHICALLY. *ad.* (from *hieroglyphical.*) Emblematically (*Brown*).

HIEROGRAMMATISTS, (*Hierogrammatei*), i. e. *holy registers*, were an order of priests among the ancient Egyptians, who presided over learning and religion. They had the care of the hieroglyphics, and were the expositors of religious doctrines and opinions. They were looked upon as a kind of prophets; and it is pretended, that one of them predicted to an Egyptian king, that an Israelite (meaning Moses), eminent for his qualifications and achievements, would lessen and depress the Egyptian monarchy. The hierogrammatei were always near the king, to assist him with their information and counsels.

HIERO'GRAPHY. *s.* (ἱερος and γραφω.) Holy writing.

HIEROMANCY, in antiquity, that species of divination which predicted future events from observing the various things offered in sacrifice. See Divination and Sacrifice.

HIEROMENIA, a name given to the month in which the Nemean games were celebrated. It answered to part of our August and September.

HIEROMNOMON, in Grecian antiquity, a delegate chosen by lot, and sent to the great council of the Amphictyons, where he took care of what concerned religion. The same word denoted an officer of the Greek church, who put the pontifical robes on the patriarch, and shewed him the prayers, &c. he was to read. It also denoted a stone used in divination.

HIEROPHANTES, or Hierophanta, (from ἱερος, *holy*, and φαινομαι, *I appear*,) in antiquity, a priest among the Athenians. The Hierophantes instructed persons in the mysteries of their religion; and it was a part of his office to dress and adorn the statues of the gods.

To HI'GGLE. *v. n.* 1. To chaffer; to be penurious in a bargain (*Hale*). 2. To go selling provisions from door to door.

HIGGLEDY-PIGGLEDY. *ad.* A cant word corrupted from *higgle*, which denotes any confused mass.

HIGGLER. *s.* (from *higgle*.) One who sells provisions by retail.

HIGH. *a.* (heah, Sax.) 1. Long upward; rising above from the surface, or from the centre (*Burnet*). 2. Elevated in place; raised aloft (*Locke*). 3. Exalted in nature (*Baxter*). 4. Elevated in rank or condition (*Dryden*). 5. Exalted in sentiment (*Milton*). 6. Difficult; abstruse (*Shakspeare*). 7. Boastful; ostentatious (*Clarendon*). 8. Arrogant; proud; lofty (*Clarendon*). 9. Severe; oppressive (*Bacon*). 10. Noble; illustrious (*Shakspeare*). 11. Violent; tempestuous; loud: applied to the wind (*Denham*). 12. Tumultuous; turbulent; ungovernable (*Dryden*). 13. Full; complete: applied to time (*Spenser*). 14. Raised to any great degree (*Baker*). 15. Advancing in latitude from the line (*Ab.*). 16. At the most perfect state; in the meridian (*Genesis*). 17. Far advanced into antiquity (*Brown*). 18. Dear; exorbitant in price (*South*). 19. Capital; great; opposed to little: as *high* treason, in opposition to *petty*.

High, in music, is sometimes used in the same sense with *loud*, in opposition to *low*; at others, it is used for *acute*, as opposed to *grave*.

High. *s.* High place; elevation; superior region (*Dryden*).

On High. *ad.* Aloft; above; into superior regions (*Dryden*).

High-blest. *a.* Supremely happy (*Milton*).

High-blown. *a.* Swelled much with wind; much inflated (*Shakspeare*).

High-born. *a.* Of noble extraction (*Rowe*).

High-coloured. *a.* Having a deep or glaring colour (*Floyer*).

HIGH-DESIGNING. *a.* Having great schemes (*Dryden*).

HIGH-FED. *a.* Pampered (*L'Estrange*).

HIGH-FLIER. *s.* One that carries his opinion to extravagance (*Swift*).

HIGH-FLOWN. *a.* 1. Elevated; proud (*Denham*). 2. Turgid; extravagant (*L'Estrange*).

HIGH-FLYING. *a.* Extravagant in claims or opinions (*Dryden*).

HIGH-HEAPED. *a.* 1. Covered with high piles (*Pope*). 2. Raised into high piles (*Pope*).

HIGH-METTLED. *a.* Proud or ardent of spirit (*Garth*).

HIGH-MINDED. *a.* Proud; arrogant (*Shakspeare*).

HIGH-PRIEST. See PONTIFEX and PRIEST.

HIGH-RED. *a.* Deeply red (*Boyle*).

HIGH-SEASONED. *a.* Piquant to the palate (*Locke*).

HIGH-SPIRITED. *a.* Bold; daring; insolent.

HIGH-STOMACHED. *a.* Obstinate; lofty.

HIGH-TASTED. *a.* Gustful; piquant.

HIGH-VICED. *a.* Enormously wicked (*Shakspeare*).

HIGH-WAY, a free passage for the king's subjects, on which account it is called the king's high-way, though the freehold of the soil belong to the lord of the manor, or the owner of the land. Those ways that lead from one town to another, and such as are drift or cart-ways, and are for all travellers in great roads, or that communicate with them, are highways only; and as to their reparation, are under the care of surveyors.

Every justice of the peace, by the statute, upon his own view, or on oath made to him by the surveyor, may make presentment of roads being out of repair; and, thereupon, like process shall be issued as upon indictment. For the repairing of highways, there are certain regulations, by statute; and every inhabitant of a parish is bound to perform certain duties for that purpose.

HIGH-WAY-MAN, one who robs on the king's high-way. It is common to distinguish between a highwayman and a footpad; the former being on horseback, the latter on foot.

HIGH-WATER, that state of the tides, when they have flowed to the greatest height, or have ceased to flow. It is high-water several minutes, as many as between 15 and 30, before it begins to ebb again.

HIGH-WROUGHT. *a.* Accurately finished.

HIGHAM FERRERS, a borough of Northamptonshire, with a market on Saturdays. It sends one member to parliament. Lat. 52. 19 N. Lon. 0. 40 W.

HIGHGATE, a large village in Middlesex, seated on a hill E. of that of Hampstead; on which account, these two hills have been poetically called The Sister Hills. It is 4 miles N. by W. of London.

HIGHLAND. *s.* (*high* and *land.*) Mountainous region (*Addison*).

HIGHLANDERS, a general appellation for the inhabitants of the mountainous parts of any country. In Britain it is appropriated to the people who inhabit the mountainous parts of Scotland, to the north and north-west, including those of the Hebrides or Western Isles. They are a branch of the ancient Celtæ; and undoubtedly the descendants of the first inhabitants of Britain, as appears from the many monuments of their language still retained in the most ancient names of places in all parts of the island. The Highlanders, or, as they are often termed by ancient authors, the Caledonians, were always a brave, warlike, and hardy race of people; and in the remotest times, seem to have possessed a degree of refinement in sentiment and manners then unknown to the nations that surrounded them. This appears not only from their own traditions and poems, but also from the testimony of many ancient authors. This civilization was probably owing in a great measure to the order of the bards, or Druids, and some other institutions peculiar to this people.

The Highlanders always enjoyed a king and government of their own, till Kenneth M'Alpine (anno 845), after having subdued the Pictish kingdom, transferred thither the seat of royalty. This event proved very unfavourable to the virtues of the Highlanders, which from this period began to decline. The country, no longer awed by the presence of the sovereign, fell into anarchy and confusion. The chieftains began to extend their authority, to form factions, and to foment divisions and feuds between contending clans. The laws were either too feeble to bind them, or too remote to take notice of them. Hence sprung all those evils which long disgraced the country, and disturbed the peace of its inhabitants. Robbery or plunder, provided it was committed on any one of an adverse clan or tribe, was countenanced and authorised; and their reprisals on one another were perpetual. Thus quarrels were handed down from one generation to another, and the whole clan were bound in honour to espouse the cause of every individual that belonged to it. By this means the genius of the people was greatly altered; and the Highlanders of a few ages back were almost as remarkable for their irregular and disorderly way of life as their predecessors were for their civilization and virtue. It is from not attending to this distinction between the ancient Highlanders and their posterity in later times, that many have doubted the existence of those exalted virtues ascribed by their poets to the more ancient inhabitants of the country. But now that the power of the chieftains is again abolished, law established, and property secured, the genius of the people (where it is not hindered by some other extraneous cause) begins again to shew itself in its genuine colours; and many of their ancient virtues begin to shine with conspicuous lustre. Justice, generosity, honesty, friendship, peace, and love, are perhaps no where more cultivated than among this people. But one of the strongest features which marked the cha-

racter of the Highlanders in every age, was their hospitality and benevolence to strangers.

The language of the Highlanders is still the Gaelic; which, with many of their customs and manners, has been secured to them by their mountains and fastnesses, amidst the many revolutions which the rest of the island has undergone in so long a course of ages. The Gaelic seems to be the oldest and purest dialect which remains of the Celtic, as appears from its approaching the nearest to the names of places, &c. which that language left in most countries where it prevailed; and from its most obvious affinity to those tongues, ancient or modern, which have been in any measure derived from the old Celtic. The Gaelic has all the marks of an original and primitive language. Most of the words are expressive of some property or quality of the objects which they denote. This, together with the variety of its sounds (many of which, especially of those that express the soft and mournful passions, are peculiar to itself), renders it highly adapted for poetry. It is generally allowed to have been the language of court, in Scotland, till the reign of Malcolm Canmore. The Gaelic epithet of *Canmore*, or "large head," by which this king is distinguished, seems to intimate so much. In some particular parliaments at least, it was spoken much later, as in that held by Robert the Bruce at Ardchattan. That it has been formerly a good deal cultivated, appears from the style and complexion of its poems and tales, and from several ancient MSS. that have come down to the present times. To strangers the Gaelic has a forbidding aspect, on account of the number of its quiescent consonants (which are retained to mark the derivation of words, and their variation in case and tense); but its sound is abundantly musical and harmonious, and its genius strong and masculine. Its alphabet consists of 18 letters, of which one is an aspirate, 12 are consonants, and five are vowels.

The Highlanders have begun of late years to apply to learning, agriculture, and especially to commerce, for which their country, every where indented with arms of the sea, is peculiarly favourable. Cattle is the chief staple of the country; but it produces more grain than would supply its inhabitants, if so much of it were not consumed in whisky. The natives are beginning to avail themselves of their mines, woods, wool, and fisheries; and by a vigorous application, with the due encouragement of government, may become a prosperous and useful people.

The Highlanders are of a quick and penetrating genius, strongly tinctured with a thirst of knowledge, which disposes them to learn any thing very readily. They are active, persevering, industrious, and economical. They are remarkably bold and adventurous, which qualifies them for being excellent seamen and soldiers.

HIGHLY. *ad.* (from *high.*) 1. With elevation as to place and situation. 2. In a great degree (*Atterbury*). 3. Proudly; arrogantly; ambitiously (*Shakspeare.*) 4. With esteem; with estimation (*Romans*).

HIGHMORE (Joseph), an eminent painter, was born in London in 1692. He was bred an attorney; but he abandoned that profession, for the one which was more congenial with his talents; and by close application soon became an accomplished artist. He painted the portraits of several eminent personages; particularly of the great duke of Cumberland, and the prince and princess of Wales. He also painted a set of pictures, the subjects of which were taken from Mr. Richardson's Pamela. At the institution of the Academy of Painting, &c. he was chosen one of the professors. His greatest performances are, Hagar and Ishmael, at the Foundling Hospital; the finding of Moses; and the good Samaritan. Mr. Highmore was also eminent for his literary abilities, and published, 1. A Critical Examination of the two paintings by Rubens, on the cieling of the banqueting-house at Whitehall, &c. 4to. 1754. 2. The Practice of Perspective, on the Principles of Dr. Brooke Taylor, 4to. 1763. 3. Observations on a pamphlet, entitled Christianity not founded on Argument, 1765. 4. Two volumes of Essays, 1766, 12mo. He died in 1780, and was buried in Canterbury cathedral.

HI'GHMOST. *a.* Highest; topmost (*Shakspeare*).

HI'GHNESS. *s.* (from *high.*) 1. Elevation above the surface; loftiness. 2. The title of princes, anciently of kings. 3. Dignity of nature; supremacy (*Job*).

HIGHT. *imperf. verb.* 1. Was named; was called (*Dryden*). 2. Called; named (*Spenser*).

HIGHWORTH, a town in Wilts, with a market on Wednesdays. Lat. 51. 36 N. Lon. 1. 40 W.

HILARIA, festivals at Rome, held in March, in honour of the mother of the gods.

HILA'RITY. *s.* (*hilaritas*, Latin.) Merriment; gayety (*Brown*).

HILARIUS, an ancient father of the Christian church, who flourished in the 4th century. He was born, as St. Jerome informs us, at Poictiers, of a good family; who gave him a liberal education in the Pagan religion, which he did not forsake till he was arrived at maturity. He was advanced to the bishopric of Poictiers in the year 355, according to Baronius; and became a most zealous champion for the orthodox faith, particularly against the Arians, who were at that time gaining ground in France. He assembled several councils there, in which the determinations of the synods of Rimini and Seleucia were condemned. He wrote a treatise concerning synods; and a famous work in 12 books on the Trinity, which is much admired by the orthodox believers. He died in the latter end of the year 367. His works have been many times published; but the last and best edition

of them was given by the Benedictines at Paris in 1693.

HILARODI, Ιλαρωδοι, compounded of ιλαρος, *joyful*, and ωδη, *song*, in the ancient music and poetry, a sort of poets among the Greeks, who went about singing little merry diverting poems or songs; though somewhat graver than the Ionic pieces. They dressed in white, and were crowned with gold. At first they wore shoes; but afterwards they assumed the crepida, which was only a soal tied over the foot with straps. The poems they sung were called *Hilarodia*.

HILARY TERM. See TERM.

HILDESHEIM, a strong town of Lower Saxony, in Germany. Lat. 52. 10 N. Lon. 10. 10 E.

HILDBERHAUSEN, a town of Franconia, in Germany. Lat. 50. 53 N. Lon. 11. 3 E.

HILDESLEY (Mark), an excellent English bishop, was born at Marston in Kent, in 1698, and educated at the Charter-House; from this seminary he was sent to Trinity college, Cambridge, where he was chosen fellow in 1723. In 1731 he obtained the college living of Hitchin, and four years afterwards that of Holwell, in Bedfordshire, where he distinguished himself by the faithful discharge of his ministerial duties. On the death of Dr. Wilson, bishop of Sodor and Man, the duke of Athol appointed Dr. Hildesley to succeed him; in this office he trod closely in the steps of his evangelical predecessor, whose laudable design of printing a translation of the Bible in the Manks language, he brought to a conclusion. This worthy prelate died in 1772.

HI'LDING. *s.* (hılꝺ, Saxon, signifies a lord; perhaps *hilding* means originally a *little lord.*) 1. A sorry, paltry, cowardly fellow (*Shakspeare*). 2 It is used likewise for a mean woman (*Shakspeare*).

HILL. *s.* (hıl, Saxon.) An elevation of ground less than a mountain (*Granville*).

HILL (Aaron), an English poet, was born at London in 1685. At the age of fifteen he went to Constantinople to visit his relation lord Paget, then ambassador there, who took great notice of him. About 1703 he returned with his lordship, and a few years afterwards he accompanied sir William Wentworth on the tour of Europe. In 1709 he was made master of Drury-lane theatre, on which he wrote his Elfrid, or the Fair Inconstant. The following year he became master of the Opera-house, and then wrote the opera of Rinaldo, which was the first that Handel composed after he came to England. About 1718 he wrote a poem called the Northern Star, by way of panegyric on Peter the Great, for which the Empress Catherine, some years after, sent him a gold medal. He was a great schemer as well as a poet; but as in the former character he never acquired riches, so in the latter he never rose far above mediocrity. His works were published in four volumes, 8vo. after his death, which happened in 1750.

HILL (sir John), a voluminous English writer, was born in 1716, and bred to the business of an apothecary, which he carried on for some years in St. Martin's-lane. His first publication was a translation of Theophrastus's Tract on Gems, which procured him friends and reputation. This induced him to undertake a general Natural History, in 3 vols. folio. He became now a general writer, and all subjects were alike to him. He published a supplement to Chambers's Cyclopædia, and conducted a Magazine, and a daily paper under the title of the Inspector. At this time he obtained his degree of M. D. from Scotland, and became a man of the world. He also set up as an empyric, and invented some remedies which brought him a good deal of money. The earl of Bute became his patron, and under his protection he commenced a voluminous work, called, the System of Botany; this he sent to the king of Sweden, who invested him with one of his orders of knighthood. This singular man died in 1775. Besides the works above mentioned he wrote many others, as, Mrs. Glasse's Cookery; a Review of the Works of the Royal Society; some novels, and a few farces. These last performances brought him into a controversy with Garrick, who fired the following epigram at him:

For physic and farces, his equal there scarce is;
His farces are physic, his physic a farce is.
(*Watkins*).

HILLIA. In botany, a genus of the class hexandria, order monogynia Calyx double, the lower one six-leaved, upper one from two to four leaved; corol very long, twisted; capsule inferior, two-celled, many-seeded; seeds invested with long down. Two species: shrubs of Jamaica.

HILLSBOROUGH, a borough of Ireland, in the county of Down, with a thriving manufacture of muslins. Lat. 54. 26 N. Lon. 6. 2 W.

HI'LLOCK. *s.* (from *hill.*) A little hill (*Sidney*).

HI'LLY. *a.* (from *hill.*) Full of hills; unequal in the surface (*Howell.*)

HILT. *s.* (hilt, Saxon.) The handle of any thing, particularly of a sword (*Pope*).

HI'LUM. The eye. In botany, peculiarly so called in the bean, and generally in other seeds. The external mark or scar of the umbilical chord on those seeds, in which they adhere to the pericarp.—Cicatrix umbilicalis. Regn. Veg.—Cicatrix externa seminis ab ejusdem affixione in fructu. Philos. Bot.—As in Cardiospermum, Staphylæa, Dolichos, &c.

HIM. *s.* (him. Saxon.) The oblique case of He.

HIMMALEH, mountains of Asia, which separate the countries of Cachimere and Cashgar from Thibet. These mountains were known to the ancients under the name of Imaus, or Himaus.

HI'MSELF. *pron.* (*him* and *self.*) 1. In

the nominative, *he* (*Bacon*). 2. In ancient authors, itself (*Shakspeare*). 3. In the oblique cases it has a reciprocal signification (*Samuel*).

By HIMSELF. Alone; unaccompanied (*Kings*).

HIN. *s.* (הין) A measure of liquids among the Jews, containing about ten pints (*Exodus.*)

HINCHINBROOK ISLAND, one of the New Hebrides, in the S. Pacific Ocean. Lat. 17. 25 S. Lon. 168. 33 E.

HINCKLEY, a town in Leicestershire, with a market on Mondays. Here is a considerable stocking-manufactory. Lat. 52. 34 N. Lon. 1. 20 W.

HIND. *a.* compar. *hinder*; superl. *hindmost.* (hyndan, Saxon.) Backward; contrary in position to the face (*Ray*).

HIND. *s.* (hinde, Saxon.) 1. The she to a stag (*Spenser*). 2. (hine, Saxon.) A servant (*Shakspeare*). 3. (hineman, Sax.) A peasant; a boor (*Dryden*).

HIND-BERRY, in botany. See RUBUS.

HINDELOPEN, a seaport of the United Provinces, in Friesland, seated upon the Zuyder Zee. Lat. 52. 58 N. Lon. 5. 10 E.

To HI'NDER. *v. a.* (hinðpian, Saxon.) To obstruct; to stop; to let; to impede (*Taylor*).

To HI'NDER. *v. n.* To raise hinderances; to cause impediment (*Dryden*).

HI'NDER. *a.* (from *hind.*) That is in a position contrary to that of the face (*Sidney*).

HI'NDERANCE. *s.* (from *hinder.*) Impediment; let; stop; obstruction (*Atterbury*).

HI'NDERER. *s.* (from *hinder.*) He who or that which hinders or obstructs (*May*).

HI'NDERLING. *s.* (from *hind* or *hinder.*) A paltry, worthless, degenerate animal.

HI'NDERMOST. *a.* Hindmost; last (*Shakspeare*).

HINDIA, a town of the Deccan of Hindustan, capital of a district of the same name in the country of Candeish. Lat. 22. 35 N. Lon. 77. 10 E.

HI'NDMOST. *a.* (*hind* and *most.*) The last; the lag; that comes in the rear (*Pope*).

HINDON, a borough in Wilts, with a market on Thursdays. Lat. 51. 6 N. Lon. 2. 9 W. It sends two members to parliament.

HINDOOS, or HINDUS, the inhabitants of that part of India known by the name of Hindustan, or the Mogul's empire, who profess the religion of the Bramins, supposed to be the same with that of the ancient Gymnosophists of Ethiopia.

From the earliest period of history these people seem to have maintained the same religion, laws, and customs, which they do at this day: and indeed they and the Chinese are examples of perseverance in these respects altogether unknown in the western world. At the present period they are divided into four casts or tribes: 1. The Bramin; 2. The Khatry; 3. The Bhyse; and, 4. The Soodera. All these have distinct and separate offices, and cannot, according to their laws, intermingle with each other; but for certain offences they are subject to the loss of their cast, which is reckoned the highest punishment they can suffer; and hence is formed a kind of fifth cast named Pariars on the coast of Coromandel, but in the Sanscrit or sacred language Chandalas. These are esteemed the dregs of the people, and are never employed but in the meanest offices. There is besides a general division which pervades the four casts indiscriminately; and which is taken from the worship of their gods Vishnou and Sheevah; the worshippers of the former being named Vishnou-bukht; of the latter, Sheevah-bukht.

Of these four casts the bramins are accounted the foremost in every respect; and all the laws have such an evident partiality towards them, as cannot but induce us to suppose that they have had the principal hand in framing them. They are not, however, allowed to assume the sovereignty; the religious ceremonies and the instruction of the people being their peculiar province. They alone are allowed to read the Veda or sacred books; the Khatries, or cast next in dignity, being only allowed to hear them read; while the other two can only read the Sastras, or commentaries upon them. As for the poor Chandalas, they dare not enter a temple, or be present at any religious ceremony. The sovereigns are chosen from among the second cast. The Bhyse or Banians, who constitute the third cast, have the charge of commercial affairs; and the Soodera, or fourth cast, the most numerous of all, comprehends the labourers and artisans. These last are divided into as many classes as there are followers of different arts; all the children being invariably brought up to the profession of their fathers, and it being absolutely unlawful for them ever to alter it afterwards.

When a man has lost cast, his most intimate friends and nearest relatives forsake him for ever. Were a Hindu of any other cast to touch a Chandala, even by accident, he must wash himself and change his raiment: he would refrain from the productions of the earth, if he knew they had been cultivated by a Chandala. In fact, the punishment of expulsion from cast, which is supposed in its consequences to extend even to another life, becomes more terrible to a Hindu than that of death.

The religion of the Hindus is contained in four books, named *Veda*, *Vedams*, or *Bedis*, written in a language called *Sanscrit*, which is now known only to the learned among them. The books are supposed to have been the work, not of the supreme God himself, but of an inferior deity named Bramha. They inform us, that Brama, or Brahma, the supreme God, having created the world by the word of his mouth, formed a female deity named Bawaney, who in an enthusiasm of joy and praise brought forth three eggs. From these were produced three male deities, named *Bramha*, *Vishnou*, and *Sheevah*, or *Seeb*. Bramha was endowed with the power of creating the things of this world, Vishnou with that of cherishing them, and Sheevah

ith that of restraining and correcting them. 'hus Brimha became the creator of man; and ı this character he formed the four casts from ifferent parts of his own body, the Bramins om his mouth, the Khatry from his arms, ıe Banians from his belly and thighs, and ıe Soodera from his feet. Hence, say they, ıese four different casts derive the different ffices assigned them: the Bramins to teach; ıe Khatry to defend and govern; the Banians › enrich by commerce and agriculture; and ıe Soodera to labour, serve, and obey. rama himself endowed mankind with pasons, and understanding to regulate them; hile Brimha, having created the inferior eings, proceeded to write the Vedas, and elivered them to be read and explained by the ramins.

The four Vedas contain 100,000 stanzas in erse, each consisting of four lines. Each of ıese Vedas has a particular name, descriptive f its nature, or the subject it treats upon: ız. 1. *Rug Beda*. 2. *Sheham*. 3. *Judger Beda*. 4. *Obater Bah*. There are also *hasters*, or books that treat of divinity; the hief of these are the *Bedang*, the *Neadersen*, d the *Dirm* Shasters; and the Hindus are vided into sects, according to the Shaster ey adopt. Besides these sacred books there e 18 others called *Poorans*, which are all ommentaries on the *Vedas*; it is the custom f the Bramins to get most of these by heart.

The Hindu Shasters make God a respecter f persons; inasmuch as no other nation nder heaven can be of their religion, which lmits of no proselytes: in this respect, proıbly their religion differs from every other.

The religion of the Hindus, though now ıvolved in superstition and idolatry, seems to ave been much purer in its origin: the folwing account of the Deity is translated from eir original scriptures by Mr. Holwell:— God is one—Creator of all that is.—God is ke a perfect sphere, without beginning or d.—God rules and governs all creatures by general providence, resulting from first dermined and fixed principles.——Thou shalt ot make enquiry into the essence and nature f the existence of the Eternal One, nor by hat laws he governs.—An enquiry into either vain and criminal.—It is enough that day y day, and night by night, thou seest in is works, his wisdom, power, and mercy.— enefit thereby."

In the Hindu religious systems, the peculiar octrines of the Trinity, of the Incarnation of ıe Deity, of atonement for sin, and of the ıfluences of the Divine Spirit, are so strongly presented as to leave no doubt that, notithstanding the general corruptness of their rinciples and practices, they were once deved from the Christian scriptures. 1st, The octrine of the Trinity. The Hindus believe ı one God, Brahma, the creator of all things; nd yet they represent him as subsisting in ıree persons: and they worship one or other f these persons throughout every part of ndia. And what proves that they hold this doctrine distinctly is, that their most ancient representation of the Deity is formed of one body and three faces. 2dly, The doctrine of the incarnation of the Deity. The Hindus believe that one of the persons in their Trinity (and that, too, the second person) was "manifested in the flesh." Hence their fables of the incarnations of Vishnu. 3dly. The doctrine of atonement for sin, by the shedding of blood. To this day, in Hindustan the people bring the goat or kid to the temple, and the priest sheds the blood of the innocent victim. 4thly, The doctrine of the influence of the Spirit of God. In the most ancient writings of the Hindus, it is asserted that the "divine spirit, or light of holy knowledge," influences the minds of men, and the man who is the subject of such influence is called "the man twice-born:" many chapters are devoted to the duties, character, and virtues, of "the man twice born."

Among the Hindus there are two kinds of worship; distinguished by the names of the worship of the invisible God, and of idols. The worshippers of the invisible God are, strictly speaking, deists: the idolaters perform many absurd and unmeaning ceremonies, too tedious to mention, all of which are conducted by a Bramin; and during the performance of these rites, the dancing-women occasionally perform in the court, singing the praises of the Deity in concert with various instruments.

The Hindus have a multitude of demigods, who are supposed to inhabit the air, the earth, and the waters, and in short the whole world; so that every mountain, river, wood, town, village, &c. has one of these tutelar deities, as was the case among the western heathens. By nature these demigods are subject to death, but they are supposed to obtain immortality by the use of a certain drink named *Amrut*. Their exploits in many instances resemble those of Bacchus, Hercules, Theseus, &c.; and in a beautiful epic poem named *Rancyun*, we have an account of the wars of Ram, one of the demigods, with Ravana tyrant of Ceylon.

All these deities are worshipped, as in other countries, by going to their temples, fasting, prayers, and the performance of ceremonies to their honour. They pray thrice a day, at morning, noon, and evening, turning their faces towards the east. They use many ablutions, and, like the Pharisees of old, they always wash before meals. Running water is always preferred for this purpose to such as stagnates. Fruits, flowers, incense, and money, are offered in sacrifice to their idols; but for the dead they offer a kind of cake named *Peenda*; and offerings of this kind always take place on the day of the full moon.

The Hindus have a great veneration for fire and water. Every day at sun-rise the priests go to some river, or to the tanks of their temples, to worship. Of all their rivers the Ganges is the most highly venerated; they say it takes away all the spots of sin, because,

springing from the foot of their god *Vishnou*, it descends into the paradise of *devendne*, and thence into Hindustan: therefore the Indians go in crowds to wash at this river.

Great numbers of devotees are to be met with among the Hindus. Every cast, except the Chandalahs, may assume this way of life. Those held most in esteem are named *Seniasses*, and *Jogeys*, or *Yogeys*. The former are allowed no other clothing but what suffices for covering their nakedness, nor have they any worldly goods besides a pitcher and staff; but though they are strictly enjoined to meditate on the truths contained in the sacred writings, they are expressly forbidden to argue about them. The Yogeys are bound to much the same rules, and both subject themselves to the most extravagant penances. Some will keep their arms constantly stretched over their heads till they become quite withered and incapable of motion; others keep them crossed over their breast during life; while others, by keeping their hands constantly shut, have them quite pierced through by the growth of their nails. Some chain themselves to trees or particular spots of ground, which they never quit; others resolve never to lie down, but sleep leaning against a tree: but the most curious penance perhaps on record is that of a Yogey, who measured the distance between Benares and Jaggernaut with the length of his body, lying down and rising alternately. Many of these enthusiasts will throw themselves in the way of the chariots of Vishnou or Sheevah, which are sometimes brought forth in procession to celebrate the feast of a temple, and drawn by several hundreds of men. Thus the wretched devotees are in an instant crushed to pieces. Others devote themselves to the flames, in order to shew their regard to some of their idols, or to appease the wrath of one whom they suppose to be offended. Indeed it would be endless to describe their various modes of torturing themselves.

A certain set of devotees are named *Pandarams*; and another on the coast of Coromandel are named *Cary-Putra Pandarams*. The former rub themselves all over with cow-dung, running about the country singing the praises of the god Sheevah whom they worship. The latter go about asking charity at doors by striking their hands together, for they never speak. They accept of nothing but rice. Another kind of mendicants are called *Tadinums*; they sing the incarnations of Vishnou.

Among the Hindus, marriage is considered as a religious duty; and parents are strictly commanded to marry their children by the time they arrive at eleven years of age at farthest. Marriages are often contracted at 2 or 3 years of age: and it is no unusual thing to hear a married child crying bitterly when carrying about in the *d'hooly*, or Bengal palanquin. The parties remain separate until a certain time, when they are fully united with numerous formalities. Polygamy is allowed; but this licence is seldom made use of.

Among these people the custom of burn the dead prevails universally; and the ho practice of wives burning themselves al with their deceased husbands was formerly common, though now much less so. T piece of barbarity is not enjoined by any existing among the Hindus; it is only sai be proper, and rewards are promised in next world to those who do so. But tho a wife choose to outlive her husband, sh in no case whatever permitted to marry ag even though the marriage with the former never been completed. It is unlawful fo woman to burn herself if she be with chil the time of her husband's decease, or if died at a distance from her. In the l case, however, she may do so if she can cure his girdle or turban to be put on the neral pile along with her.

Some Hindus, though few, bury their de and in these cases, it is reckoned the du the widow to bury herself with the bod her husband. Craufurd heard of two instai of this dreadful ceremony.

The Hindus are very loquacious, and deceitful, but not malicious: they are f of amusements, particularly dancing. T do not, however, learn or practise danc themselves, but have women taught for purpose; and in beholding these they spend whole nights. They disapprove of m parts of the education of European ladies, supposing that they engage the attention much, and draw away a woman's affect from her husband and children. Hence th are few women in Hindustan who can ei write or read. In general they are fi shaped, gentle in their manners, and h soft and even musical voices. The womei Kashmere, according to Mr. Forster, ha bright olive complexion, fine features, delicate shape; and a pleasing freedom in t manners, without any tendency to immode

The dress of the modest women in H dustan consists of a close jacket, which co their breasts, but perfectly shews their fo The sleeves are tight, and reach half-way the elbows, with a narrow border paintec embroidered all round the edges. Insteac a petticoat, they have a piece of white cot cloth wrapped round the loins, and reachin near the ancle on the one side, but not q so low on the other. A wide piece of mu is thrown over the right shoulder; whi passing under the left arm, is crossed rou the middle, and hangs down to the feet. T hair is usually rolled up into a knot or bu towards the back part of the head; and sc have curls hanging before and behind the e They wear bracelets on their arms, and ring their ears, and on their fingers, toes, ancles, with sometimes a small one in nostril.

The men generally shave their heads beards, leaving only a pair of small whisk and a lock on the back part of their he which they take great care to preserve. Kashmere and some other places, they let th

ds grow to the length of two inches. They ; turbans on their heads; but the bramins officiate in the temples, commonly go their heads uncovered, and the upper of the body naked: round their shoulders hang the sacred string called *Zennar*, e of a kind of perennial cotton, and comd of a certain number of threads of a rmined length. The Khatries wear also ing of this kind, but composed of fewer ads; the Bhyse have one with still fewer ads; but the Sooderas are not allowed to r any string. The other dress of the nins consists of a piece of white cotton wrapped about the loins, descending w the knee, but lower on the left than on right side. In cold weather they somes put a red cap on their heads, and wrap awl round their bodies.

he progress of the Hindus in geometry as as astronomy has been very great in ant times. Of this a most remarkable ince is given by Mr. Playfair, in their finding the proportion of the circumference of a e to its diameter, to a great degree of accy. This is determined, in the *Ayeen ary*, to be as 3927 to 1250; which, to t arithmetically in the simplest manner ible, would require the inscription of a gon of 768 sides; an operation which cannot erformed without the knowledge of some curious properties of the circle, and at nine extractions of the square root, each ar as ten places of decimals. This proion of 1250 to 3927 is the same with that to 3.1416; and differs very little from of 113 to 355 discovered by Metius. He Vieta were the first who surpassed the racy of Archimedes in the solution of this lem; and it is remarkable that these two hematicians flourished at the very time the Ayeen Akbary was composed among Hindus. In geography, however, they much deficient; and it is very difficult to out the true situation of the meridians tioned by their authors, from what they said concerning them.

'he art of painting among the Hindus is in mperfect state; nor are there any remains ntiquity which evince its ever having been e perfect than it is now. Their principal ct is in drawing, and being almost totally rant of the rules of perspective. They are h better skilled in colouring; and some of r pictures are finished with great nicety. ir sculptures are likewise rude, and greatly mble those of the Egyptians. They seem ollow no regular rules in architecture: r temples indeed are filled with innumercolumns, but most of them without any shape or proportion. They are principally arkable for their immense size, which gives n an air of majesty and grandeur.

'he music of the Hindus is but little known uropeans; and the art seems to have made little progress among them, in comparison what it has done in the western countries; gh some of the Indian airs are said to be very melodious. A specimen of one of their tunes is given in the Periodical Accounts of the Baptist Missionary Society, No. 3; to the various Numbers of which we also refer for much other curious and interesting information. See also Maurice's History of Hindustan; the Asiatic Researches; Buchanan's Travels in the Mysore; Cunningham's Christianity in India, &c.

HINDUSTAN, a country of Asia, bounded on the north by the mountains of Tartary and Thibet, on the east by the countries of Assam, Meckley, and Aracan, on the south by the sea, and on the west by the river Indus, or Sinde. But, strictly speaking, the name Hindustan should only be applied to the part which lies to the north of the 21st and 22d degrees of latitude; the Nerbudda river being the southern boundary, as far as it goes, while Bengal and Bahar bound the south elsewhere. The country in the south side of this line is called by the general name of *Deccan*; but this division is not generally followed, and the term *Hindustan* is applied to the whole region, as well as to Hindustan Proper. Hindustan Proper, in the opinion of Major Rennel, is in extent about equal to France, Germany, Bohemia, Hungary, Swisserland, Italy, and the Netherlands, collectively; while the Deccan and peninsula are about equal to the British islands, Spain, and European Turkey. The words Hindustan and India are originally Persian. This country was but little known to the ancients; it was invaded, but not conquered, by Alexander the Great. The Arabians penetrated into India under the calif Valid, and the Arabian princes founded an empire which extended to the Ganges. In 1155, this empire was usurped by the Ghaurs, who were dispossessed in their turn by a dynasty of Turkish princes. In the year 1398, a sultan, named Mahmoud, reigned here, under the protection of two of his generals, who had placed him on his throne. At this time Hindustan was invaded by Timur Bek, or Tamerlane, who passed the Indus with his army, conquered the provinces which he passed through, and arrived at Delhi through rivers of blood. Mahmoud was vanquished, Delhi was destroyed, and all Hindustan submitted; but of all this vast and rich conquest, the descendants of Timur Bek enjoyed only the northern part. Babr, one of his descendants, invaded Hindustan in the year 1498, at that time divided into several independent kingdoms and states; his first attempts were unsuccessful, but afterwards he subdued the greater part, except the Deccan, Guzerat, and Bengal. His son Hemayun subdued Bengal. At his death, which happened at Delhi, his son Akbar was proclaimed emperor, in 1556, who encreased his empire by conquest, and enriched it by commerce. Aurengzebe conquered Bengal, Visiapour, the Carnatic, and Golconda. In the year 1739, in the reign of Mohammed Shah, Hindustan was invaded by Tahmasp Kuli Khan, otherwise called Nadir Shah, king of Persia, which

put an end to the great splendour of the Mogul empire. Besides the great riches, said to have amounted to upwards of 230 millions sterling, which he seized on during his residence at Delhi, all the provinces west of the Sinde were surrendered to the conqueror. Mohammed was reinstated indeed in his dominions, but without power to enforce obedience to his commands. Several of the provinces revolted; Achmet Abdallah, treasurer to Nadir Shah, who was assassinated in 1747, found means to secrete vast sums of money, and erected an independent kingdom, of which Candahar was the capital. At present, the empire of Hindustan is confined to the city of Delhi and a small country round it; and, perhaps, the protection of the English is the greatest support of the descendant of Timur Bek. Before the invasion of Nadir Shah, the government was despotic; there were no permanent councils; and three or four ministers, raised or deposed according to the caprice of their master, were the depositaries of his power. Hindustan is inhabited by people of different kinds, as the Hindus, the Patans, or Afghans, the Baluchis, the Parsis, and the Mongols, or Tartars, besides foreigners, particularly Jews and Christians. All, excepting the Hindus, who are the ancient inhabitants, have settled there by conquest or accident; having been induced by commerce, or compelled by war and persecution, to abandon their native countries. The Hindus are the ancient occupants; and, though subject to the Mongols, still preserve the superiority in number. The Parsis are the descendants of the ancient Persians, who worshipped the fire. These, to avoid the persecution of the Mohammedans, on their first conquest of Persia, fled in great numbers by the sea to India; where they settled on the western peninsula, chiefly about Surat, and there they still remain. The Patans were those from whom the Mongols conquered Hindustan; and are most likely the descendants of those Mohammedans, Turks, Persians, and Arabs, who about the year 1000 first became masters of Delhi and Moultan, under Sultan Mahmud Gazni. These people are still very numerous throughout Hindustan, and especially in the north-west parts beyond the Sinde towards Cabul, Ghizni, and Candahar; from whence, in all probability, they originally came. They still inhabit the same provinces of the Persian empire, where they are chiefly known by the name of Afghans: they have a great aversion to the Mongols for having dispossessed them of their territories; and, being high-spirited, still entertain hopes of recovering from them what they seized. The meanest of them frequently use this expression, "let me never be king of Delhi, if it be not so." These people are fierce and warlike. They now possess many of the mountainous parts; where some have erected petty sovereignties, like the rajahs. They have from time to time given great uneasiness to the Mongols, and had no small share in the revolution brought about in that empire by Nadir Shah. The Baluchi a another nation, who possess several parts Hindustan to the west of the Sinde, or Indu they are spread over all the large province Mecran and the neighbouring parts. Th are a barbarous people, addicted to rapir and pay little obedience to the monarchs whom they are subject. The Moguls, Jagatays, are the descendants of the army Timur Bek, who have held chief rule India from that time. Among the Christiar the Portuguese were the first to establi themselves on the continent and in the islan chiefly by force, but were afterwards alm every where dispossessed by the Dutch. T settlements obtained by the English, Frenc and Danes, have chiefly been formed by tre with the inhabitants, or grants from t princes. Of the several nations above me tioned, the Hindus and Parsis are Pagan but excel most of the rest in proper depo ment. The Patans, Baluchins, and Mogo are Mohammedans. The two first, given arms, are of a restless disposition, subject slight occasions to revolt, and plunder th neighbours without distinction. In the ti of Aurengzebe, the provinces which compos the Mogul empire were Delhi, Agra, Ag mere, Moultan, Sindy, Lahore or Punja Oude, Allahabad, Bengal, Bahar, Oris Cabul, Cachimere, Malwa, Guzerat, Ber Candeish, Dowlatabad, Beder, Hydraba or Golconda, and Visiapour, all which pr duced an annual revenue of about 32 millio sterling. At the present time, Bengal, t greater part of Bahar, with part of Allahaba and Orissa, belong to the English, who also in possession of the northern circars, jaghire in the Carnatic, Baramahal, Dindig and some considerable countries to the N. a S. of Calicut, on the coast of Malabar, wi the island and territory of Bombay. Oude governed by a nabob, in alliance with Gr Britain, as likewise the eastern part of Dell Allahabad, Malwa, Dowlatabad, part Guzerat, Orissa, Berar, Agra, Agimere, a Visiapour, are governed by *Mahratta* princ in smaller states, chiefly under the name *Rajahs*. Golconda, Aurungabad, Bed part of Berar, &c. are subject to the *Soub* of the Deccan. Lahore, Moultan, and t western parts of Delhi, are subject to t *Seiks*, or descendants of a famous Hindu nam *Nanuck*, of the cast of Khatry, who w born in 1470. He formed a sect, who w purely deists, and reprobated the worship idols. The southern parts of the penins are the Mysore, the Carnatic, Tanjo Cochin, Travancore, Madura, Tinevell Coimbetore, Canara, and a few smaller sta subject to the king of Mysore. The Carnat including Tanjore, Madura, Tinevelly, a Marawars, are allies to the British; so likewi are Cochin and Travancore. The native i habitants of Hindustan amount to abo 10,000,000 Mahometans, and 100,000,0 Hindus.

The British territories in the East Ind

vere originally under the jurisdiction of a governor and 13 members; but this number has fluctuated occasionally from 14 to 4, at which it was fixed by act of parliament. In this council, all matters, whether relating to peace or war, government or commerce, were debated, the governor having no other superiority than that of giving the casting vote. In other respects the whole executive power was lodged in his hands, and all the correspondence with the native princes of India was carried on by his means, the dispatches to them being signed by him singly; and all the princes and great men who visited the presidency were first received by him, and then introduced to the counsellors. He was military governor of Fort William, and commander in chief of the presidency; whence, as by his office he was invested with a considerable degree of power, he became an object of some envy and jealousy to the members of the council and other considerable people in that part of the world. This circumstance occasioned the government to be divided into two parties, one siding with the governor, and the other opposing him; in consequence of which, the debates were frequently carried on with an indecent degree of heat and violence. This indeed may be looked upon as one of the principal causes by which the reputation of the British government in the eastern parts of the world has suffered; for, as there were very frequently opinions diametrically opposite to one another recorded upon the same subject, the contending parties in the British parliament had always sufficient authority for what they said, let them take which side they would; and thus the characters of all concerned in the East India government were, with great appearance of justice, set forth in the most opprobrious light. Another source of just reproach was, that the court of directors in England became infected with the same spirit of party which pervaded all other departments of the state; and hence arose innumerable disputes and contentions highly disgraceful to those concerned.

With regard to the administration of British affairs in the East Indies, it must indeed be remarked, that the company now act in a very different capacity from what they originally did. From a society of merchants, they are now become sovereigns of the country to which they trade. The latter character was quite foreign to them; and they have accordingly looked upon that of merchants as the principal one, while that of sovereigns was to be only a kind of appendage to it. Thus, instead of acting for the interest of the country they govern, and which as sovereigns they naturally ought to do, they have acted in many cases directly opposite to it, which, as merchants, is also their natural interest. Hence also, when the administration in India did any thing in obedience to the orders of the directors, which orders being dictated by merchants were prejudicial to the interests of the country, that injury has been sometimes unjustly attributed to their servants, who acted merely in obedience to the orders they received. On the other hand, when the India administration acted with the generous spirit of sovereigns, they were sometimes blamed by the directors, who judged as merchants; and sometimes by the ministry, who were always ready, upon the smallest pretence, to interfere in their affairs.

At the time when the British administration first commenced in Hindustan, the Hindu governors were universally named *Rajahs*; but though many of the Hindu families yet bear that title, it does not appear to resemble, in any manner of way, our titles of nobility, or to be a dignity which can be conferred by any of the princes, or even by the Mogul himself. Hence, in that part of the world there are no ancient nobility; the titles being conferred merely by usurpers, who have neither right nor title derived from any thing but violence.

From a comparison of any government to which the Hindus have yet been subject, with that of Britain, it is evident that the preference must be decidedly given to the latter. At the time when the British first visited that country, they were not under the jurisdiction of their native sovereigns, nor had they been so for a long time before. The Moguls were not only foreigners, but a most cruel and detestable race of men; and it was by usurpations of their own rebellious subjects that the anarchy and confusion was introduced, in which the country was so long involved. The British are foreigners, as well as the Moguls; but the latter, who profess the intolerant superstition of Mohammed, suffer their conduct to be influenced by it in such a manner as to treat the native Hindus with the utmost cruelty. The greatest evil perhaps which results from the British government is, the exportation of great sums of money to a foreign country; but this evil, with respect to the provinces possessed by the British, existed also under the Mohammedan government; and indeed there is great reason to conclude, that under this government, matters were still worse, even in this respect, than under that of Britain.

One great objection, however, to the India government is, that the English law, which undoubtedly is better calculated than any other for securing the liberties of the people, has not yet been adopted in India; whence it is thought that the company's servants have still shewed a disposition to oppress, rather than to relieve, the oppressed inhabitants of Hindustan. But in answer to this it is said, that the difference betwixt the two countries is so great, that there can be no comparison betwixt the one and the other, nor can the constitution of England be in any degree adapted to that of the other. The religion, laws, manners, and customs, of both Hindus and Mohammedans, are so essentially different from those of this country, that it is impossible to assimilate them, should ever any thing of the kind be

attempted. The only true method therefore of judging whether the present state of Hindustan is preferable to what it formerly was, is to compare it with what it was under the best Mogul emperors; and in this comparison it must certainly appear that the preference is greatly in favour of the British administration. In Major Rennel's work we are informed, that during the reign of Akbar, whom he styles "the glory of the house of Timur," the country had never enjoyed so much tranquillity; "but this tranquillity would hardly be deemed such in any other quarter of the world, and must therefore be understood to mean a state short of actual rebellion, or at least commotion." The same author, speaking of the state of the British empire there, uses the following words: "The Bengal provinces, which have been in our actual possession near 23 years, have, during that whole period, enjoyed a greater share of tranquillity than any other part of India, or indeed than those provinces had ever experienced since the days of Aurengzebe." To this we may add, that the provinces have not only experienced a perfect freedom from external invasions, but likewise enjoy a degree of internal tranquillity altogether unknown before, by the subjection and civilization of a set of banditti who inhabited the hills of Rajemahl, and infested the travellers who passed that way; a wandering tribe of religious mendicants, who were wont to commit the greatest enormities.

Towards the north, Hindustan is very cold and barren; but towards the south, very hot, and fertile in corn, rice, fruits, and other vegetables. The northern provinces are very mountainous and sandy; while the southern are for the most part level, and well watered by several rivers.

The most remarkable mountains are those which surround it on three sides. Those on the west, separating it from Persia, called, in general, *Soleyman Kay*, or *the mountains of Soleyman*, are of a vast height as well as breadth, and are only passable in certain places, through which roads have been made for the sake of commerce. The chief are those which lead to Kabul, Gazna, and Kandahar. This great chain of mountains is inhabited by different nations, the principal of which are the Afghans, or Patans, and the Baluches, who have extended themselves on the side of India, as well as Persia. The mountains on the north are called *Negrakut*, *Hima*, or *Mûs Tâg*, which has an affinity with *Imaus*, and by other names, which are given also in common to the mountains on each side, separating Hindustan from Thibet. The very prospect of these mountains is frightful; being nothing but hideous precipices, perpetually covered with snow, and not to be crossed without the greatest danger and difficulty.

The most remarkable rivers of Hindustan are the Indus and Ganges. The former is called by the orientals, *Send*, *Sind*, or *Sindi*. It rises in the mountains to the north or north-east of Hindustan; whence, after a long course, first to the south and then to the south-west, it falls into the Persian sea, below Lowe Bander, by several mouths. In its course i *receives several other large rivers, as the* [illegible]*ah Jamal, Behat, and Lakka.* The *Ganges* called in the Indies *Ganga*, rises in the kingdom of Thibet; entering Hindustan abou the 30th degree of latitude, it runs first south-eastward by the cities of Bekâner, Minapor Halabas, Banâres, and Patna, to Rajah Mah where it divides into two branches. Th eastern having passed by Dâkka, the capital o Bengal, enters the gulph of that name abou Chatigan. The western, descending by Kossum-Bazar and Hughly, falls into the gulph below Shandernagor, towards Pipeli. Many of the Jews and ancient Christians believe this river to be the Pison, one of the four mentioned in scripture as the boundaries of the terrestrial paradise. The Indians retain the greatest reverence for its waters, going in crowds from the remotest parts of the country to wash in them, from a persuasion that they wholly obliterate the spots of sin. See HINDUS Nothing is more childish than the fables o the Bramins on this subject, yet the peopl swallow them all. The Mogul and prince o Golconda drink no other water than that of the Ganges: foreigners, on the contrary, allege that it is very unwholesome, and that it canno be safely drunk till it is first boiled. There are a great number of superb pagodas on the banks of the Ganges, which are immensely rich. At certain festivals, there has beer sometimes a concourse of 100,000 people who came to bathe in it. But what principally distinguishes this river, besides it greatness and rapidity, is the gold it brings down in its sands and throws on its banks; and the precious stones and pearls it produces, not only in itself, but in the gulph of Bengal, into which it discharges its waters, and which abound therewith. The Chun or Jemma, the Guderasu, the Persilis, Lakia, and several other rivers, discharge themselves into it during its course.

The weather and seasons are, for the most part, very regular in this spacious country: the winds blowing constantly for six months from the south, and six from the north, with very little variation. The months of April, May, and the beginning of June, till the rains fall, are so extremely hot, that the reflexion from the ground is apt to blister the face; and but for the breeze or small gale of wind which blows every day, there would be no living in that country for people bred in northern climates; for, excepting in the rainy season, the coldest day is hotter there at noon than the hottest day in England. However, very surprizing changes of heat and cold sometimes happen within a few hours; so that a stifling hot day is succeeded by a night cold enough to produce a thin ice on the water, and that night by a noon as scorching as the preceding. Sometimes, in the dry season, before the rains, the winds blow with such extreme violence, that they carry vast quantities of dust and sand into

the air, which appear black, like clouds charged with rain; but fall down in dry showers, filling the eyes, ears, and nostrils of those among whom they descend, and entering every chest, cabinet, or cupboard, in the houses or tents, by the key-hole or crevices.

From Surat to Agra, and beyond, it seldom or never rains, excepting in one season of the year; that is, from the middle of June to the middle of September. These rains generally begin and end with most furious storms of thunder and lightning. During these three months it rains usually every day, and sometimes for a week together without intermission: by this means the land is enriched, like Egypt by the Nile. Although the land looked before like the barren sands of the Arabian deserts; yet, in a few days after these showers begin to fall, the surface appears covered with verdure. When the rainy season is over, the sky becomes perfectly serene again, and scarce one cloud appears all the other nine months: however, a refreshing dew falls every night during that dry interval, which cools the air, and cherishes the earth.

We cannot conclude this article without noticing the laudable attempt made by the Baptists of England, to dispel the " gross darkness which covers the land" of Hindustan with respect to religion, by sending over Missionaries to propagate the light of Christianity among the benighted natives of those regions. Considering the almost insurmountable obstacle of the cast (see HINDUS,) the success of these Missionaries has been greater than many expected. They have printed and circulated translations of the New Testament in the Bengallee dialect, and other eastern languages; and this has induced many of the natives to come to them with the question of the gaoler, " Sirs, what must we do to be saved?" to join with them in Christian worship and fellowship, and completely to abandon their wonted superstitions. See MISSIONS.

To HINGE. *v. a.* (from the noun.) 1. To furnish with hinges. 2. To bend as a hinge (*Shakspeare*).

HINGES. *s.* (*or hingle*, from *hangle* or *hang*.) 1. Iron or brass joints, whereby doors, tables, &c. open, shut, or fold. 2. The cardinal points of the world (*Creech*). 3. Governing rules or principles (*Temple*). 4. *To be off the* HINGES. To be in a state of irregularity and disorder (*Tillotson*).

HINGES are of different denominations: as butts, used by the joiners for hanging table-leaves, &c.; casement, for hanging casements upon dove-tails; and esses, for light doors and lockers; garnet-cross, for hanging large doors or heavy scuttles in ships; port, for hanging ships' ports; scuttle, particularly used for scuttles. Besides these, there are many others of different forms and uses, distinguished by different names.

The upper part of plate 86 is a representation of a contrivance for causing a door to shut to, which is to be applied to those doors which swing open both ways; and the office of the spring is to shut it either way. As this is the case, it is evident that the ordinary spring used for shutting doors cannot be used; for if the action which caused the door to shut, be continued after it is closed, the door will be opened again. Fig. 1 is an elevation of the lower part of a door, shewing the mechanism beneath the floor; and fig. 2 is a plan of the same, the floor being supposed to be removed. The door AA is not hung upon hinges as in common, but is mounted upon pivots at the top and bottom: the lower pivot *a* is firmly screwed to the bottom of the door by an iron arm *b*, and works in a brass socket *d*, fixed below the floor. The upper pivot of the door is nearly the same, except that it is shorter, the socket being close to the arm *d*, and screwed to the door-case *e*. is a semicircular arch of cast iron, fitted upon a square, upon the lower pivot *a*: to this arch the ends of two chains *fg* are pinned; the other ends of the chains are passed round a barrel *h*, and pinned fast to it. The barrel contains a spiral spring, which is coiled up within it. The inner end or the spring is hooked to an arbor in the centre of the barrel, whose ends come through the barrel: the outer end of the coil of spring is riveted to the inside of the barrel. The ends of the arbor of the barrel are filed square, and fitted into square holes in the bridge *i*, and the plate *k*, so that it cannot turn round the spring at the same time, being set considerably upon the strain, that it may draw the chain *f* and *g* tight. It will be easily seen, that if the door is moved either way from the position of the dotted lines *l l* fig. 2, it will turn the arc *e* with it, and wind up one or other of the chains *f* or *g*, and by that means draw off some of the chain from the spring-barrel; at the same time the opposite chain is wound off the arc, and, not being taken up by the spring barrel, lies slack between them. When the force which caused the door to open is removed, the spring-barrel draws the chain which is wound up, and brings the door back again until it arrives at the position *ll* fig. 2, when both chains have an equal share of the force exerted by the spring barrel; and if the door is opened on the other side, that chain which was slack before, will now take up the spring, and the other will become slack. The semicircular arc *e*, upon which the chains wind, is not fixed to the pivot *a* of the door by its centre, but very nearly in its circumference. By this means, when the door is shut, as in the figure, the chains act upon a long lever, and have considerable force upon the door to keep it so: but when the door is turned one quarter round (that is, set open), the chain draws very near the centre, and has but little power upon the door, so that it may easily be held open.

These hinges are the invention of Mr. Morris, Whitcomb-street, London, who manufactures them. We have seen some of them in action, which answered extremely well.

HINGHAM, a town of Norfolk, with a market on Saturdays. Lat. 52. 43 N. Lon. 1. 4 E.

HINNOM, or the Valley of Hinnom, in ancient geography, a place that lay to the south of Jerusalem. It was also called the Valley of Tophet, and was remarkable for the cruel and barbarous worship of the god Moloch, in which parents made their children pass through the fire in honour of that idol.

HINNY, in mastiology. See EQUUS.

To HINT. *v. a.* (*enter*, French, *Skinner*.) To bring to mind by a slight mention or remote allusion; to mention imperfectly (*Pope*).

To HINT *at*. To allude to; to touch slightly upon (*Addison*).

HINT. *s.* (from the verb.) 1. Faint notice given to the mind; remote allusion; distant insinuation (*South*). 2. Suggestion; intimation (*Addison*).

HINZUAN, or JOANNA, one of the Comora islands, between the north end of Madagascar and the continent of Africa. It is about thirty miles long, and fifteen broad. The sea-coasts of this island are chiefly in the hands of Arabians, who have obtained a settlement, and driven the original natives to the interior and mountainous parts, though the latter are double the number of the former. Though not the largest, it is the principal, and demands tribute of the others. The island produces oranges, lemons, limes, cocoa-nuts, yams, bananas, pine-apples, with some antiscorbutic plants, the principal of which is purslane: the inhabitants are fond of the English, and the English language; and most of them claim the title of lord, duke, or prince, and on the arrival of a vessel, solicit custom, or presents, under those characters, hoping to obtain something more substantial. Lon. 44. 48 E. Greenwich. Lat. 12. 14 S.

The inhabitants, like those of most hot and tropical countries, are indolent, and do not improve by their labour the richness of that soil with which nature has blessed them. "Climate here," says major Rooke, "promotes vegetation to such a degree as requires little toil in the husbandman; but that little is denied; so that beyond oranges, bananas, pine-apples, cocoa-nuts, yams, and purslane (all growing spontaneously), few vegetables are met with. Nor are the natural beauties of the island inferior to its other advantages of plenty and fertility. The face of the country is very picturesque and pleasing, its scenes being drawn by the bold strokes of Nature's masterly pencil. Lofty mountains clothed to their very summits, deep and rugged valleys adorned by frequent cataracts, cascades, woods, rocks, and rivulets, intermixed in "gay theatric pride," form the landscape. Groves are seen extending over the plains to the very edge of the sea, formed principally by the cocoa-nut trees, whose long and naked stems leave a clear and uninterrupted passage beneath; while their tufted and overspreading tops form a thick shade above, and keep off the scorching rays of the sun. In the interior part of the island, surrounded by mountains of a prodigious height, and about 15 miles from this town, is situated a sacred lake, half a mile in circumference. The adjacent hills, covered with lofty trees, and the unfrequented solitude of the place, seem more calculated to inspire religious awe in those who visit this sequestered spot, than any sanctity that is to be discovered in a parcel of wild ducks inhabiting it, which are deified and worshipped by the original natives, who consult them as oracles on all important affairs, and sacrifice to them. Being extremely averse to conduct strangers thither, they stipulate that all guns shall be left at a place five miles from the lake. The worship paid to these birds ensures their safety and tranquillity; and rendering them of course perfectly tame, they fearlessly approach any one who goes there. The Arabian part of the islanders hold this barbarous superstition in the utmost detestation; but dare not forbid the practice of it, so bigoted to it are the others."

HIORRING, a town of Denmark, in N. Jutland, once the see of a bishop, which is now removed to Alburg. Lat. 57. 2 N. Lon. 9. 38 E.

HIP. *s.* (hype, Saxon.) 1. The joint of the thigh (*Brown*). 2. The haunch; the flesh of the thigh (*Dryden*). 3. *To have on the* HIP. (A low phrase.) To have an advantage over another (*Shakspeare*).

To HIP. *v. a.* (from the noun.) 1. To sprain or shoot the hip (*Shakspeare*). 2. HIP-HOP. A cant word formed by the reduplication of *hop* (*Congreve*).

HIP. *interj.* An exclamation, or calling to one.

HIP, the fruit of the briar. See ROSA.

HIPS, in building, pieces of timber placed at the corners of roofs, and which are longer than the rafters on account of their oblique position.

HIP means also the angle formed by two parts of the roof, when it rises outwards.

HIP-ROOF, called also Italian roof, is one in which two parts of the roof meet in an angle, rising outwards: the same angle being called a valley when it sinks inwards.

HIP-TILES, those which are made of such a form as to fit over the hips and angles of roofs.

HIP-SHOT, in the manage, an injury sustained by a horse in wringing or spraining his hips or haunches. In this case the horse halts, and moves sideways, trailing his legs after him; the affected hip becomes lower than the opposite, and falls away in flesh. Stimulatives, and especially a rowel, when the inflammation has subsided, appear most likely to be serviceable. This injury, however, is sometimes confounded with a dislocation of the hip.

HIP, HI'PPISH. *a.* A corruption of *hypochondriack* (*Ainsworth*).

HIPPA, in entomology, a tribe of the genus cancer, as arranged by Fabricius. See CANCER.

HIPPARCHUS, a celebrated astronomer of antiquity, was born at Nice in Bithynia, and flourished between 160 and 135 years before Christ. He is accounted the first who, from vague and scattered observations, reduced

stronomy into a science, and prosecuted the udy of it systematically. Pliny often menons him, and always with great commendaon. He was the first, he tells us, who attempted count the number of the fixed stars; and his atalogue is preserved in Ptolemy's Almagest, here they are all noted according to their lontudes and apparent magnitudes. Pliny places m among those men of a sublime genius, ho, by foretelling the eclipses, taught mannd, that they ought not to be frightened at ese phenomena. He foretold the course and lipses of the sun and moon for 600 years. e was also the first who discovered the pression of the equinoxes; and he invented me new instruments. His Commentary on e Phenomena of Aratus is still extant; a rrect edition of it was published by Petavius.

HIPPIA. In botany, a genus of the class ngenesia, order polygamia necessaria. Reptacle naked, downless; seeds with very oad margins, naked; calyx hemispheric, mewhat imbricate; florets of the ray ten, solete, two or three cleft. Four species: rubs of the Cape, South America, India, d Portugal.

HIPPIATRICE, (of ιππος, horse, and ιατρος, ysician,) the art of curing the diseases of utes, and particularly horses.

HIPPIUM, in antiquity, that part of the ippodrome which was beaten with the rse's feet.

HIPPOBOSCA. In zoology, a genus of e class insecta, order dipterous. Mouth th a short, cylindrical, straight, two-valved cker, the valves equal; antennas filiform; t armed with numerous claws; body flat d hard. Five species: four of them common our own country.

1. H. equina. Horse-fly; wings obtuse; orax variegated; feet armed with four claws; ad brown; legs annulate with yellow and own. Inhabits Europe, and especially the w Forest, and is very troublesome to horses: y hide themselves under the hairs, and ach themselves firmly to the skin, by means their crooked nails. Their general appearce is that of a large bug. See Nat. Hist. Pl. XXXI.

2. H. avicularia. Wings obtuse; thorax maculate; body dull brown, with a slight t of green. Inhabits Europe, on the body various birds, especially swallows.

3. H. hirundinis. Wings tapering to a nt; feet with six claws; body brown, with blueish cast; abdomen darker. Inhabits rope, on the bodies and in the nests of allows, swifts, and martins.

4. H. ovina. Wingless; body dull, tesous; legs hairy, claws double. Inhabits rope, is found among the wool of sheep, l is generally known by the name of sheep-t. It more properly belongs to the apterous ss.

5. H. uralensis. Black, hairy, with three s of white shining vesicles on the back. nabits Ural. All these species deposit an or pupa, for it may be denominated either, nearly as large as the size of the parent body itself; the fly in some of them is produced from the pupa in a month, in others the pupa continues inert through the winter, and is only entomised in the spring.

HIPPOCAMPUS, or SEAHORSE. See SYNGNATHUS.

HIPPOCASTANUM, (*hippocastanum*. ιπποκαςανον, from ιππος, a horse, and καςανον, a chesnut, so called from its size). Common horse-chesnut. Æsculus hippocastanum, foliolis septenis, of Linnéus. The fruit, when dried and powdered, is recommended as an errhine. The bark is highly esteemed on the continent as a febrifuge, and is by some considered as being superior in quality to the Peruvian bark. The bark intended for medical use is to be taken from those branches which are neither very young nor very old. See ÆSCULUS.

HIPPOCENTAUR, formed of ιππος, horse, κεντεω, *pungo*, I spur, and ταυρος, bull, in antiquity, a fabulous monster, supposed to be half horse and half man.

HIPPOCRAS, a medicinal drink, composed of wine, with spices and other ingredients; much used among the French by way of a cordial dram after meals. There are various kinds of hippocras, according to the sort of wine and the other additional ingredients made use of; as white hippocras, red hippocras, claret hippocras, strawberry hippocras, hippocras without wine, cyder hippocras, &c.

HIPPOCRATEA. In botany, a genus of the class triandria, order monogynia. Calyx five-parted; petals five; capsules inversely heart-shaped. Three species: climbing plant of the West Indies.

HIPPOCRATES, a celebrated physician, of Cos, one of the Cyclades. He improved himself in physic by reading the tablets in the temples of the gods, where each individual had written down the diseases under which he had laboured, and the means by which he had recovered. He delivered Athens from a dreadful pestilence in the beginning of the Peloponnesian war, and was publicly rewarded with a golden crown. He devoted all his time to the service of his country. From his judicious remarks and experiments, succeeding physicians have received the most valuable advantages. He died in the 99th year of his age, B. C. 361, free from all disorders of the mind or body. His writings, few of which remain, have procured him the epithet of Divine. The best editions of his works are those of Geneva, folio, 1657; Amsterdam, 2 vols. 8vo. 1665; and Vienna, 2 vols. folio, 1740.

HIPPOCRATIA, in antiquity, feasts celebrated by the Arcadians in honour of the equestrian Neptune, from a notion that this deity conferred horses on men.

HIPPOCRENE, in ancient geography, a fountain of mount Helicon, on the borders of Bœotia, sacred to the muses. Some, as Ovid, make Hippocrene and Aganippe the same.

HIPPOCREPIS. Horse-shoe vetch. In botany, a genus of the class diadelphia, order

decandria. Calyx five-toothed; loment jointed, compressed with several deep notches on one of its sutures, curved. Five species: four indigenous to Europe, and one to Cochin China. Of the European plants, one (h. comosa), is common to the chalk hills of England. They are all low, herbaceous, trailing plants, with yellow flowers, scarcely worthy of the gardener's attention.

HIPPODROME, HIPPODROMUS (composed of ιππος, horse, and δρομος, course, of the verb δρεμω, *curro*, I run), in antiquity, a list or course wherein chariot and horse races were performed, and horses exercised. The Olympian hippodrome or horse-course, was a space of ground of 600 paces long, surrounded with a wall, near the city of Elis, and on the banks of the river Alpheus. It was uneven, and in some degree irregular, on account of the situation; in one part was a hill of a moderate height, and the circuit was adorned with temples, altars, and other embellishments. See STADIUM. We have in England several vestiges of the Hippodromus: besides the remarkable one near Stonehenge, Dr. Stukeley speaks of one near Dorchester, another near Penrith, and another near Royston.

HIPPODROMUS is also the Bœotian name for the month Ecatombæon.

HIPPOGLOSSUS, in ichthyology. See PLEURONECTES.

HIPPOGRIFF. *s.* (ιππος and γρυψ.) A winged horse (*Milton*).

HIPPO'LAPATHUM, (*hippolapathum*, ιππολαπαθον, from ιππος, a horse, and λαπαθον, the lapathum; a species of lapathum so named from its size.) See RHABARBARUM MONACHORUM.

HIPPOLYTUS, in fabulous history, a son of Theseus and Hippolyte, famous for his continence. His step-mother Phædra fell in love with him, and when he refused to pollute his father's bed, she accused him of offering violence to her person before Theseus, who believed the accusation, and entreated Neptune to punish severely the incontinence of his son. Hippolytus fled from the resentment of his father, and, as he pursued his way along the sea shore, his horses were so frightened at the noise of sea-calves, which Neptune had purposely sent thither, that they ran about the rocks till his chariot was broken, and his body torn to pieces. *Ovid. Virg.*

HIPPO'MANE. Manchineel-tree. In botany, a genus of the class monoecia, order monadelphia. Male: an ament; perianth cloven; corolless. Fem.: perianth three-cleft; corolless; stigma three-parted; drupe or capsule three-grained. Three species: natives of the West Indies and America.

1. H. manicella. Leaves ovate, serrate, with two glands at the base. The milky juice of this tree is highly poisonous, and was at one time in frequent use among the Indians as a poison for the tips of their arrows. The poisonous property pervades nearly equally the fruit and the wood. Hence the incautious traveller, tempted by the appearance of the first, has often fallen a victim to the violence of its morbid stimulus: for the poison seems to depend on a peculiar acrimony alone; and hence also the fellers of the timber, which on account of the closeness and beauty of its grain is in much esteem among our cabinet-makers, are compelled to dry the trunk by making fires around it, before they attempt to fell it; while the sawyers find it requisite to blind their eyes while sawing, to avoid ophthalmic inflammations, which the pungent aroma that flies about them is otherwise sure to produce. If the juice of this tree touch the skin, it generally blisters it; and if it fall on linen, it corrodes it like vitriolic acid, the spotted parts turning black, and terminating in holes. This is a West Indian tree.

2. H. spinosa. Leaves somewhat ovate, with spinous teeth, like the holly. A native of South America.

3. H. biglandulosa. Leaves ovate-oblong, with two glands at the base. Also a native of S. America. Both these latter possess an acrimonious and poisonous juice of the same kind as that of h. manicella, but less pungent and fatal. Neither of them is so lofty, and especially the second: for while h. manicella rises to the size of a large oak, and offers some such appearance, h. spinosa seldom attains more than twenty feet in height, and has the external character of a holly. See BUCKTHORN.

HIPPOPHÆ. Sea Buckthorn. In botany, a genus of the class monoecia, order tetrandria. Male: calyx two-parted; corolless. Fem.: calyx tubular, cloven; style one; berry superior, one-seeded; seed with a double coat. Two species, as follows:

1. H. rhamnoides: with lanceolate leaves, found wild on our own sea-coasts; the stem shrubby, of a dark brown bark, branching irregularly eight or ten feet high.

2. H. Canadensis: with ovate leaves, silvery beneath: a native of Canada, and about the size of the former. The first species is eaten by goats, sheep and horses, but refused by cows. Of the second no sufficient trial has been made.

HIPPOPHAGI, in ancient geography, a people of Scythia, so called from their living on horse-flesh; the fare at this day of the Tartars their descendants. Also a people of Persia (Ptolemy.)

HIPPOPODES, HIPPOPEDES, or HIPPOPODIÆ, composed of ιππος horse, and πους foot, in the ancient geography, an appellation given to a certain people situated on the banks of the Scythian sea, as being supposed to have had horses' feet. The hippopodes are mentioned by Dionysius, Geogr. v. 310. Mela, lib. iii. cap. 6. Pliny, lib. iv. cap. 13. and St. Augustine, De Civit. lib xvi. cap. 8. But it is conjectured, that they had this appellation given them on account of their swiftness, or lightness of foot.

HIPPOPOTAMUS. River-Horse. In zoology, a genus of the class mammalia, order belluæ. Fore-teeth in each jaw four; upper four in pairs, remote; lower prominent; intermediate ones longer; tusks solitary, lower, very

long, obliquely truncate, recurvate; feet hoofed at the margin. One species only:

H. amphibius. Feet four-lobed; head large; mouth very wide; skin thick, dark, almost naked; teeth very white, harder than ivory, and do not grow yellow with age: tusks from twenty to twenty-six inches long, weighing six or seven pounds; grinders six above, eight below, on each side; ears small, acute, ciliate, with short fine hairs; eyes and nostrils large; lips tufted with hair; tail naked, about a foot in length; legs short, thick; lobes of the feet not connected; flesh sometimes eaten; fat occasionally used in pulmonary diseases.

Africa seems to be the only division of the globe inhabited by this species. The Nile, the Niger, the Gambia, and the Zaira, are the chief rivers in which they have been discovered. But they are observed through all the other considerable rivers, and the lakes of the African continent. From the information of the Jesuits, and of a later and more accurate observer, Mr. Bruce, we learn, that they abound in all the lakes and rivers of Abyssinia, Nubia, and Upper Egypt. Cultivation has expelled them from Lower Egypt. Sparrman represents them as not less numerous in the southern parts of Africa. It had been imagined, that hippopotami never ventured into the ocean, and scarcely ever descended so low as to the mouths of rivers; but this philosophical traveller relates, that he actually observed several hippopotami in salt water, at the mouths of the rivers Kromme and Camtour; and in the district of Krakekama, saw on the sea-beach evident traces of one of these animals that had come out of the sea, but instantly retired back. He was also informed by a Captain Burtz, that on the eastern coast of Africa, he had often seen hippopotami raise their heads above the surface of the sea, to breathe and neigh. In Guinea, the rivers, lakes and marshy grounds, afford numbers of them: and Sparrman was told by a party of Caffrarians, that about Konaprivier in Caffraria, they appear on land in bodies as numerous *as the pebbles* on the bed of the river. See Nat. Hist. Pl. CXXXIV.

The female produces one young which she suckles in the water. A calf caught by Sparrman and supposed to be about three weeks old measured three feet and a half in length and two in height. When caught, this calf uttered a squeaking noise, like a scared or wounded hog. The voice of the adult animal is a neighing sound, which some describe as having a perfect resemblance to the neighing of a horse; while others represent it as a loud sonorous noise, between the bellowing of an ox and the roaring of an elephant.

Although an inhabitant of the waters, the hippopotamus is well known to breathe air like land animals. On land he finds the chief part of his food. He may perhaps occasionally feed on aquatic plants; but he very often leaves the waters, and commits wide devastations through all the adjacent cultivated fields. On the banks of the Nile, he often defeats the hopes of the husban man; even a large field of corn or clover is soon entirely despoiled of verdure by his capacious jaws. In the south of Africa he commits similar ravages. Not only grass, but boughs and roots of trees and shrubs are articles of his ordinary food. In cultivated tracts, it is commonly in the night that the hippopotamus leaves his retreats in the rivers, and wanders into the fields. He descends to the bottom of the deepest river, and walks along it with the same slow, stately pace, as if on land, and breathing the open air. But he cannot continue under water beyond a certain length of time. He must ascend at intervals to the surface to discharge the contents of his lungs, and draw in fresh air. He appears at times in the sea, and is seen going out with the tide; but it appears probable, that sea-water does not serve him to drink; for Sparrman relates, that a hippopotamus, which having been disturbed in the rivers, had taken refuge in the sea, was observed to come every night on shore to drink water out of a neighbouring well, till he was at last shot. It has been pretended, that the hippopotamus devours great quantities of fish; but it appears with the fullest evidence, both from the relations of many travellers, and from the structure of the stomach in specimens which have been dissected, that he is nourished solely, or almost solely, on vegetable food. He walks with a tardy pace; and is capable of so little agility, that even a hillock or wall of a very moderate height, presents to him an insurmountable barrier. Unless when accidentally provoked or wounded, he is never offensive. But, when his fury is provoked, revenge is fully in his power. With his teeth he easily breaks a boat in pieces; or, where the river is not too deep, he will raise one on his back, and overset it.

The Egyptians practise a very artful contrivance for destroying this animal. On some place where they expect an hippopotamus to pass, they throw a large quantity of peas; these the hungry animal eagerly devours as soon as he perceives them; such a quantity of dry food soon disposes him to drink; and the water swelling the peas in his belly, these burst the vessels, and he falls dead on the shore. The Hottentots sometimes practise the same stratagem. But they more commonly either intercept the animal in pits dug in places through which he has been observed to pass, or shoot him with tin balls.

The hippopotamus in his full size is nearly as large as an elephant. He is said by many naturalists as well as divines to be the leviathan of Job; but there are various essential differences in the two characters that it seems impossible to reconcile.

HIPPOSELI'NUM. (*hipposelinum*, - ποσηλινον, from ιπποϛ, a horse, and σελινον, purslane, so named because it resembles a large kind of purslane.) Common Alexanders. This plant, Smyrnium olusatrum of Linnéus, was formerly cherished in our gardens for culinary use, but is now superseded by celery. The seeds are bitter and aromatic, and the roots are more powerfully bitter. They stand

recommended as resolvents, diuretics, and emmenagogues, though seldom used. See SMYRNIUM.

HIPPURIS. Horse-tail. Mare's tail. In botany, a genus of the class monandria, order digynia. Calyx an obsolete margin crowning the germ; petalless; stigma simple; seed one. Two species.

1. H. vulgaris. Leaves, stellate, numerous, linear, acute. Found in the ditches of our own country, and formerly used as an article in the materia medica, under the name of EQUISETRUM: which see.

2. H. tetraphylla. Lower leaves in fours, upper in sixes, obtuse. A native of the sea-shores of Sweden and Finland. Goats are the only domestic animals that will eat either species.

HI'PPUS. (*hippus*, from ἵππος, a horse, because those who labour under this affection are continually twinkling and trembling, as is usual with those who ride on horseback.) A repeated dilatation and alternate constriction of the pupil, arising from spasm or convulsion of the iris.

HIRÆA. In botany, a genus of the class decandria, order trigynia. Calyx five-leaved, without mellifluous pores, petals roundish with claws; filaments cohering at the base; capsules three, one-seeded, two-winged, or surrounded with a wing. Three species: one a tree of Carthagena, with reclining branches and inodorous flowers: the other two herbaceous plants of Guinea and Sierra Leone.

HIRCUS, in astronomy. See CAPELLA.

To HIRE. *v. a.* (hyꝛan, Saxon.) 1. To procure any thing for temporary use at a certain price (*Dryden*). 2. To engage a man in temporary service for wages (*Isaiah*). 3. To bribe (*Dryden*). 4. To engage himself for pay (*Samuel*).

HIRE. *s.* (hyꝛe, Saxon.) 1. Reward or recompense paid for the use of any thing. 2. Wages paid for service (*Spenser*)

HIRE (Philip de la), an eminent French mathematician and astronomer, born at Paris in 1640. His father, who was painter in ordinary to the king, designed him for the same profession: but he devoted himself to mathematical studies, and was nominated together with M. Picard to make the necessary observations for a new map of France, by the directions of M. Colbert. In 1683, he was employed in continuing the famous meridian line begun by M. Picard; and was next engaged in constructing those grand aqueducts which were projected by Louis XIV. The great number of works he published, either separately or in the Memoirs of the Academy of Sciences, together with his continual employments, as professor of the Royal College and of the Academy of Architecture, give us some idea of the labours he underwent. His days were always spent in study; his nights very often in astronomical observations; seldom seeking any other relief from his labours, than a change of one for another. In his manner, he had the exterior politeness, circumspection, and prudence of Italy; on which account he appeared too reserved in the eyes of his countrymen; though he was always esteemed a very honest disinterested man. He died in 1718, at 78 years of age.

HI'RELING. *s.* (from *hire.*) 1. One who serves for wages (*Sandys*). 2. A mercenary; a prostitute (*Pope*).

HI'RELING. *a.* Serving for hire; venal; mercenary (*Dryden*).

HI'RER. *s.* (from *hire*). One who uses any thing, paying a recompense; one who employs others paying wages.

HIRPINI, in ancient geography, a people of Italy, next to the Samnites, to the south-east, and descendants from them; situated to the north of the Picentini, and to the west of the Apuli, having on the north the Apennin and a part of Samnium.

HIRSCHFELD, a town of Germany, in the circle of the Upper Rhine, capital of a principality of the same name; depending on a famous abbey, which was secularized in favour of the house of Hesse Cassel. Lat. 50. 56 N. Lon. 9. 50 E.

HIRS'UTE. In botany, rough with hair, shaggy. Nearly the same with hispid, but having more hairs or bristles, and being less stiff. Applied to the stem; frond; calyx, as in Serratula alpina; and legume, as in Lathyrus odoratus.

HIRTELLA. In botany, a genus of the class pentandria, order monogynia. Petals five; filaments very long, permanent, spiral; berry one-seeded; style lateral. Three species: trees of India, West Indies, and Cayenne.

HIRTOUS. In botany, rough-haired. Nearly the same with hirsute. The hairs stiffer than intended by pilous or pilose.

HIRU'DO. Leech. In zoology, a genus of the class vermes, order intestina. Body oblong, truncate at both ends, unarmed, cartilaginous; moving by dilating the head and tail, and contracting itself into an arch. Seventeen species; some of which are found in all the four quarters of the globe. The following are the chief:

1. H. medicinalis. Medicinal leech. Elongated, olive-black, with six yellow ferruginous lines, and spotted with yellow beneath: body above composed of numerous annular wrinkles which it can contract or expand at pleasure: mouth smaller than the tail and armed with three cartilaginous teeth, with which it draws blood; tail composed of an annular muscle, by which it has the power of fastening its body to any object. Found in stagnant ponds and ditches; is viviparous; and used commonly as a phlebotomist in the practice of medicine.

2. H. sanguisuga. Horse-leech. Elongated, olive-brown, with an ochre-yellow marginal band. Found frequently in stagnant waters, ditches and ponds; from four to six inches long. This species sucks blood with great avidity and in large quantities.

3. H. viridis. Green leech. Body depressed, oblong, green, with a transparent margin, and pointed at the tail. Inhabits most clear

waters; about an eighth of an inch long; and like most of the genus has a power of reproduction nearly equal to that of the polype; for if the animal be divided crosswise, laterally, or in any other direction, the parts will become perfect animals and may be re-divided and reproduced *ad infinitum*.

4. H. stagnalis. Elongated, cinereous, with two eyes: body whitish, pellucid; eggs about forty, surrounded by a pellucid circle, at first cinereous, afterwards brown; the young, after exclusion, adhere by their nails to the belly of the mother.

5. H. geometra. Elongated, yellowish-green, with a row of white spots: body tapering before, and very broad at the tail end; colour varying; possest of four eyes. Inhabits fresh waters, and fixes itself on the bodies of the trout and other fishes after the spawning season: eight lines long: moves as if measuring like a pair of compasses.

6. H. crenata. Slightly depressed; suboval, with transverse annular striæ, the margin crenulate: body greenish, approaching to ash colour, and transversely striate; eyes two, approximate; upper surface convex, lower flat. Found in shallow streams among aquatic plants.

HIRUNDINA'RIA, (*hirundinaria*, from *hirundo*, the swallow, so named from the resemblance of its pods to a swallow.) Swallow-wort. See NUMMULARIA and VINCETOXICUM.

HIRU'NDO. Swallow. In zoology, a genus of the class aves, order passeres. Bill small, weak, curved, subulate, depressed at the base; gape larger than the head; tongue short, broad, cleft; wings long; tail mostly forked. Thirty-eight species, dispersed over the four quarters of the globe: a few of which, forming the tribe of swifts, have the four toes all placed forwards; the rest, three before and one behind.

Of all the feathered tribes, that of the swallow kind is most upon the wing. Flight seems indeed its natural, and almost necessary attitude. In that state it feeds and bathes itself, and sometimes procreates and nourishes its young. Of these facts we have an example in the swifts. Sometimes they give chace to the fluttering insects upon which they feed, displaying in the pursuit that amazing versatility which enables them to continue the objects of chace through all their winding course. At other times, they skim along the surface of the earth, or the water, seizing the small ephemeræ, or May-flies, just emerging from their aurelia state. Again, they are seen eluding the impetuosity of the most rapid birds of prey, by the great flexibility of their movements. Nature has admirably adjusted their several parts to a life, that must be supported by quick motion. Their wings are long, and adapted for continued flight. Their tails are large and forked, to enable them to turn with agility, and to be masters of their flight even in its greatest velocity.

It was formerly imagined that many individuals of several of these species, instead of migrating from colder to warmer climates in the winter, remained under ground in hybernacles, or holes of banks having a southerly exposure, whence they might occasionally be dug out altogether naked of feathers. The whole of this, however, is now known to be inconsistent with fact. No well authenticated instances of the hibernation of even the bant-swallows have yet been adduced; for these birds, contrary to what might be expected, did they remain, during winter, in a torpid state, do not use, as winter-houses, the caverns in which they nestle in summer. Banks perforated by this bird, have been dug with great care, during the winter, when nothing was found but empty nests.

The nidification of this tribe is a curious part of their economy. It is wonderful to observe with what different degrees of architectural skill Providence has endowed birds of the same genus, and nearly correspondent in their modes of life. While the swallow and the house-martin discover the greatest address in raising, and securely fixing, crusts of loam, of which their nests are formed, the bank-martin tenebrates a round hole in the sand, which is serpentine, horizontal, and about two feet deep. At the inner end of this burrow does this bird deposit in safety her rude nest, consisting of fine grasses and feathers, very inartificially laid together. At first, we might be disinclined to believe, that these weak birds, with their soft and slender bills and claws, could ever bore the stubborn sand-bank, without entirely disabling themselves; yet, with these feeble instruments, a pair of them have been seen to make great despatch. This species of swallow is greatly annoyed with fleas. Bed-fleas are often seen swarming at the mouths of their holes, like bees on the stools of their hives. Perhaps it is owing to this circumstance, that the old habitations are forsaken in the course of a few years, and new ones bored. They become foul and fœtid, and so pestered with these insects as to be no longer tenantable.

The following are the chief species of this genus:

1. H. rustica. Common swallow. Front and chin chesnut; tail feathers, except the two middle ones, with a white spot.

There is another variety with the body entirely white. Inhabits almost every where: frequents houses, and usually builds under the roof or in the chimney; leaves England in September, and previous to its departure assembles in vast flocks on the tops of houses, churches, and even trees; lays from four to six white eggs speckled with red; is said to presage stormy weather if it fly low: six inches long.

2. H. esculenta. Esculent swallow. Blackish, beneath whitish; all the tail feathers with a white spot. Inhabits China and the islands of the Indian ocean, two and a quarter inches long; builds in caverns of rocks, and makes its nest of gelatinous marine substances, in shape resembling an apple cut down the middle. These nests are found in great numbers toge-

ther, and are by the natives and luxurious Asiatics made into broths and otherwise cooked, and esteemed one of the greatest dainties of the table. If injured they serve the purpose of glue.

3. H. urbica. Martin. Bluish-black, beneath white; tail-feathers without spots.

Another variety, with quill and tail-feathers tipt with white. Bill black; mouth yellow; rump white; legs covered with a short white down. Inhabits Europe and North America: five and a half inches long; builds under the eaves of houses, but not in chimneys; eggs white.

4. H. rufa. Shining black; beneath rufous; front whitish: bill black, legs dusky black. Inhabits Cayenne: five and a half inches long; affixes its nest to beams; the nest sometimes a foot and a half long.

5. H. riparia. Sand martin. Cinereous; chin and belly white: bill blackish, throat encircled with a mouse-coloured ring; legs black; downy behind. Inhabits Europe and North America: four inches and a quarter long; builds in holes in sand-pits and banks of rivers.

6. H. purpurea. Purple swallow. Entirely violet; tail forked: bill blackish: female brown. Inhabits Carolina and Virginia during summer: is very much esteemed by the inhabitants for its use in warning poultry of the approach of birds of prey, which it does not only by shrieking, but attacking them with the greatest fury.

7. H. apus. Swift. Blackish; chin white. Inhabits almost every where; eight inches long; flies about chiefly in the morning and evening; its feet are so small that it rises from the ground and walks with great difficulty; is mostly on the wing, and rests by clinging to some wall; builds under eaves of houses, in steeples, and other lofty edifices: retires from England either by migration or becoming torpid (of which last the instances are very few) early in the autumn.

8. H. Cayennensis. White collared swift. Blackish-violet; head black, collar bifid, ocular; band and thighs white: greater wing-coverts brown edged with white; less downy. Inhabits Cayenne; five inches and a quarter long; builds a long conic nest, chiefly of the down of dog's bane curiously woven together, with a division in the middle.

HIS. *pronoun possessive.* (hyr, Saxon.) The masculine possessive. Belonging to him that was before mentioned (*Locke*).

HISPA. In zoology, a genus of the class insectæ, order coleoptera. Antennas cylindrical, approximate at the base and seated between the eyes: feelers fusiform; thorax and shells often spinous, or toothed at the tip. Twenty five species: found in the different quarters of the globe. They may be thus subdivided:

A. Lip horny; entire,

B. Lip membranaceous, subemarginate: comprising the Fabrician tribe ptilinus.

C. Lip membranaceous, entire: comprising the Fabrician tribe melasis.

Of this genus four are common to our own country: h. atra; h. pectinicornis; h. mutica; h. flabellicornis. The first is the most frequent: its antennas are fusiform; thorax and shells spinous, like the bristles of the hedge-hog; body black. It is found generally at the roots of long grass.

HISPALIS, in ancient geography, a town of Bætica, in the Farther Spain; an ancient mart or trading town on the Bætis, navigable quite up to it for ships of burthen, and thence to Corduba for river barges. Called Colonia Romulensis. It is now called Seville

HISPANIA, in ancient geography, called Hesperia Ultima, (Horace), because the westernmost part of Europe; also Iberia, from the river Iberus. Its name Hispania, or Spania, (Greek), is of Phœnician origin, from its great number of rabbits: the Phœnicians, who settled several colonies on the coast, calling it Spanjah, from these animals. It has the sea on every side, except on that next to Gaul, from which it is separated by the Pyrenées. See Spain.

HISPANIOLA, an island of the West Indies, more commonly known by the name of St. Domingo. When first discovered, it was divided into five kingdoms, and some other small independent states. The Spaniards were received at first hospitably by the natives, but their frequent quarrels, from time to time, ended nearly in their extermination. This being the first discovery made by the Spaniards, it was the centre of their commerce and was for some time a very flourishing colony, but after the discovery of Peru seems to have been neglected. In the middle of the last century, the French began to resort and settle on the island; the first that came were Buccaneers, but these were some time afterwards followed by others, who became regular planters. The court of France pretended to discourage these settlers, but took no effectual means to prevent them, and in the year 1697, by an article in the treaty of Ryswick, the Spaniards ceded the north-west part of the island to the French, containing one of the finest territories in the world. The climate, though hot, is healthy, except to new comers. Some of the inhabitants upon it are said to live to the uncommon age of 120. It is continually refreshed by breezes and rains, and its salubrity is likewise, in a great measure, owing to the beautiful variety of its surface, exhibiting hills and valleys, woods and rivers. It contains forests of palms, elms, oaks, pines, and besides several other woods, not common and hardly known in Europe; and it is generally agreed that the pine-apples, grapes, oranges, lemons, citrons, limes, dates, apricots, and other fruits have a particular taste and flavour in Hispaniola.

When the French troops under General Rochambeau were obliged to evacuate Hispaniola, the freedom and independence of the island were proclaimed by the conquering chief Dessalines: and a new empire was formed under the title of the empire of Hayti, of which Dessalines was chosen the first emperor. This hap-

pened in 1805, since which time all political distinction of colour has ceased in Hispaniola.

HISPID. In botany, applied to the stem and leaf. A hispid stem, is a stem beset with stiff bristles, as in Brassica Erucastrum. A hispid leaf is a leaf having brittle stiffish bristles scattered over the disk, as in Turritis hirsuta.

Since we cannot easily find significant English terms for all the numerous varieties of pubescence, it is perhaps best to use the Latin terms where we can. Thus here hirsute and hispid are preferable to shaggy and bristly: though for hirtous we may substitute rough-haired, or rough with hairs.

HISPI'DULA, (*hispidula*, from *hispidus*, rough, so named from the rough woolly surface of its stalks.) Cudweed. See GNAPHALIUM.

To HISS. *v. n.* (*hissen*, Dutch.) 1. To utter a noise like that of a serpent and some other animals (*Shakspeare*). 2. To condemn at a public exhibition, which is sometimes done by hissing (*Sandys*).

To Hiss. *v. a.* (hyrcean, Saxon.) 1. To condemn by hissing; to explode (*Dryden*). 2. To procure hisses or disgrace (*Shakspeare*).

Hiss. *s.* (from the verb.) 1. The voice of a serpent (*Milton*). 2. Censure; expression of contempt used in theatres (*Pope*).

HISSAR, a town of Hindustan Proper, capital of a district of the same name, in the country of Delhi. Lat. 29. 5 N. Lon. 75. 40 E.

HIST. *interj.* An exclamation commanding silence (*Swift*).

HISTER. In zoology, a genus of the class insectæ, order coleoptera. Antennas clavate, the club solid; the last joint compressed, decurved; head retractile within the body; mouth forcipated; shells shorter than the body, truncate; fore-shanks toothed, hind-shanks spinous. Twenty four species: Europe, Africa, America, Australasia. Five, inhabitants of England. The following are the chief:

1. H. unicolor. Body black, polished and brilliant; general figure almost square; thorax large, and highly polished, with a slight margin at the circumference. The most beautiful of the tribe, and often found in gardens and sandy fields: its eggs and larva have not been discovered.

2. H. bimaculatus. Black: shells striate, with a red spot behind. Found in dunghills; appearance like a small beetle.

HISTO'RIAN. *s.* (*historien*, French.) A writer of facts and events; a writer of history (*Pope*).

HISTO'RICAL. Histo'ric. *a.* (*historique*, French; *historicus*, Latin.) 1. Giving an account of facts and events (*Spenser*). 2. Pertaining to history or narrative (*Prior*).

HISTO'RICALLY. *ad.* In the manner of history; by way of narration (*Hooker*).

To HISTO'RIFY. *v. a.* (from *history*). To relate; to record in history (*Brown*).

HISTORIO'GRAPHER. *s.* (ιστορια and γραφω.) An historian; a writer of history (*Sp.*)

HISTORIO'GRAPHY. *s.* (ιστορια and γραφω.) The art or employment of an historian.

HI'STORY. *s.* (ιστορια; *histoire*, French.) 1. A narration of events and facts delivered with dignity (*Pope*). 2. Narration; relation (*Wiseman*). 3. The knowledge of facts and events (*Watts*).

History, a recital or description of things as they are, or have been, in a continued orderly narration of the principal facts and circumstances thereof. See Annals. The word is Greek, ιστορια, *historia*; and literally denotes a search of curious things, or a desire of knowing, or even a rehearsal of things we have seen; being formed of the verb ιστορειν, which properly signifies to know a thing by having seen it: though the idea appropriated to the term history is now much more extensive, and we apply it to a narration of divers memorable things, even though the relater only takes them from the report of others. The origin of the word is from the verb ισημι, I know; and hence it is, that among the ancients several of their great men were called *polyhistores*, meaning persons of various and general knowledge.

History is divided, with regard to its subject, into the history of nature and the history of actions.

History of nature, or Natural History, is a description of natural bodies; whether terrestrial, as animals, vegetables, fossils, fire, water, air, meteors, &c. or celestial, as the stars, planets, comets, &c.

Natural history is much the same with what we otherwise call physiology.

History, with regard to actions, is a continued relation of a series of memorable events in the affairs either of a single person, a nation, or several persons and nations, and whether included in a great or little space of time; or it is a narrative of such facts as are fit to be transmitted to posterity for the use of mankind and the better conduct of human life. Cicero calls history the mistress of life, (De Orat. lib. ii. cap. 9) as it teaches us both what we ought to pursue and what we ought to avoid.

Thus Thucydides has written the History of Greece; Livy, that of Rome; Mezeray and F. Daniel, of France; Tyrrel, Echard, Rapin, Goldsmith, Smollett, Hume, Adolphus, Coote, &c. the History of England; Buchanan of Scotland; Clarendon, the History of the Rebellion; and Thuanus, bishop Burnet, &c. the History of their own Lives and Times.

Eusebius, Baronius, &c. have written the History of the Church; bishop Burnet that of the Reformation, &c.

Several authors have written on the method of reading and studying history; among the rest Lucian, Bodin, Vossius the elder, Whear, Patrici, Beni, Mascardi, De Silhon, F. le Moine, F. Rapin, the abbot de St. Real, F. Thomassin, Fresnoy, &c.

History with respect to time, is divided into ancient and modern, distinguished into several epochs, periods, and intervals.

The three periods of time into which history has been divided are the following: viz. the first, from the creation to the deluge, which

age is reckoned uncertain, because we know no more than the short account given of it in the holy scriptures; the second, from the deluge to the first Olympiad, which, from the many feigned stories related in it, is called the fabulous age; the third, from the first Olympiad to our own times, is called historical, because the actions done in that period are recorded by writers of true history. See AGE.

The most ancient of the Greek historians now left is Herodotus, who lived, according to Sir Isaac Newton's Chronology, a hundred and fifty-seven years after the building of Rome. And as to the Romans, Livy himself confesses, that there were scarce any certain memoirs of their affairs till the city was taken by the Gauls, which was above a hundred years later than Herodotus; the accounts before that time having been preserved chiefly by tradition.

History, with respect to its subject, is divided into universal and particular, sacred and profane.

F. Menestrier gives us the proper characters of the divers kinds of history with great accuracy. He distinguishes history with regard to both its matter and its form, and gives curious instances of each particular.

History, with regard to its matter, is either sacred, or natural, or civil, or personal, or singular; to which some have added artificial history, giving an account of the origin and progress of arts; and miscellaneous history, which recites many various things, as they promiscuously occur in human life.

HISTORY (Sacred), is that which lays before us the mysteries and ceremonies of religion, visions, or appearances of the Deity, &c. miracles, and other supernatural things, whereof God alone is the author. Such are the book of Genesis, the Gospels, Apocalypse, &c. See MIRACLES, PROPHECY, REVELATION, &c.

To this head we may refer ecclesiastical history, which gives an account of the rise and establishment of the several religions and churches, of the rise and progress of various opinions, sects, &c. In ancient sacred history, otherwise called the history of the Old Testament, there are seven remarkable periods. The first comprehends 1656 years, from the creation of the world to the deluge; (see Sacred CHRONOLOGY.) The second period includes 857 years, from the deluge to the going forth of the Israelites out of Egypt. The third period begins with the exodus of the Israelites in 2513, extends to the times of the kings, and includes 396 years, The fourth period begins in the year of the world 2909, or from the beginning of the government by kings, and extends to the end of the Babylonish captivity, or 3468th year of the world, including 559 years. The fifth period amounts to 372 years, from the year of the world 3468 to the year 3840, or to the times of the Maccabees. The sixth period begins with Judas Maccabæus, A. M. 3840, and is continued to the year 3964, or to Herod the Great, comprehending 124 years. The seventh or last period reaches from Herod the Great to the destruction of Jerusalem, or the 70th year after the birth of Christ, containing 106 years.

In more modern sacred history, more properly called ecclesiastical history, which denotes a clear and faithful narration of the transactions, revolutions, and events, that relate to the external and internal state of the Christian church, Dr Mosheim has distinguished four remarkable periods. The first comprehends the state and vicissitudes of the Christian church, from its commencement to the time of Constantine the Great. The second period extends from the reign of Constantine to that of Charlemagne, which produced such a remarkable change in the face of Europe. The third period contains the history of the church from the time of Charlemagne to the memorable period when Luther rose in Germany to oppose the tyranny of Rome, and to deliver divine truth from the darkness that covered it. The fourth period reaches from the times of Luther to the present. On this plan Dr. Mosheim's Ecclesiastical History, a work deservedly held in great esteem, is divided into four books, containing the history of the centuries comprehended by the above periods, according to the order of time. See Holberg's Introduction to Universal History, translated by Dr. Sharpe, with notes, &c. p. 55, &c. ed. 1758; and Mosheim's Ecclesiastical History, translated by Dr. Macleane, with notes, &c. ed. 1758, vol. i. p. 12. Milner's Church History, &c.

HISTORY (Civil), is that of people, states, republics, communities, cities, &c. Such are those of Thucydides, Halicarnesseus, Livy, Polybius, Mezeray, F. Daniel, Milton, Buchanan, &c.

Civil history may be again subdivided into particular and general: the former consists of a number of facts relating to the same state, suitably connected and laid together in a proper series; such are Thucydides's History of the Peloponnesian War, comprising the events of the first twenty years of that war; Sallust's History of the War between the Romans and King Jugurtha in Africa; and Cæsar's History of his own Gallic and Civil Wars: the latter, or general history, is made up of several particular histories, whose separate transactions within the same period of time, or part of it, should be so distinctly related as to cause no confusion; such are those of Diodorus Siculus, of Herodotus, of Justin, of Xenophon, and of Polybius, among the ancients; and Thuanus's History, Lord Lyttelton's History of Henry II. Dr. Robertson's History of Charles V. &c. among the moderns.

Civil history, in its more unlimited extent, is denominated universal history.

HISTORY (Particular). See BIOGRAPHY.

HISTORY OF A SCIENCE, as of Chemistry, of Algebra, &c. Thus we have Montucla's and Bosnet's History of Mathematics, Priestley's History of Vision, Priestley's History of Electricity, Garnett's Annals of Science, &c.

In a moral point of view general and national History is extremely useful, as it points

out the issues of things, and exhibits as its general result, the reprobation consequent upon vice, and the glory which awaits virtue. In his days of nature, the oppressor may be applauded by the venal, whilst he lords it over his fellow-men, and the wanton destroyer of the human race may be hailed as a hero by the obsequious or mistaken crowd. But when his dust is mingled with that of the victims of his cruelty and ambition, history summons him to her tribunal: she scrutinizes his deeds with impartial strictness, and passes sentence upon him according to his deserts. The prejudices and errors of the present time will hereafter be done away and corrected by history, which redresses the wrongs of the injured, and treats with just contempt the insolent assumption of the undeserving. Thus, by the record of crimes no less than by the display of illustrious examples of virtue, does history inculcate good principles, and enforce upon the reflecting mind a belief in a superintending Providence.

The enlightened student of history will not direct his chief attention to the frivolous anecdotes of a court, but to the circumstances which stamp the character and decide the destiny of a nation. He will enquire what has been its radical vice or its predominant virtue; why it has been powerful or weak by sea or land; what has been the improvement or the deterioration of its trade and commerce; wherein consist the excellences and the defects of its civil and municipal institutions; what has been the constitution, and what the influence of its ecclesiastical establishments. He will trace the introduction of arts and manufactures, and observe the changes which have taken place in manners and in laws.

We may just add a few words on the particular duty of the historian; the model for whom is preserved among the works of Cicero. It is the first law of history, he says, that the writer should neither dare to advance what is false, nor to suppress what is true; that he should relate the facts with strict impartiality, free from ill-will or favour; that his narrative should distinguish the order of time, and, when necessary, give the description of places; that he should unfold the statesman's motives, and in his account of the transactions and the events, interpose his own judgment; and should not only relate what was done, but how it was done; and what share, chance, or rashness, or prudence, had in the issue; that he should give the characters of the leading men, their weight and influence, their passions, their principles, and their conduct through life. In addition to these, Tacitus gives another rule: "Præcipuum munus annalium reor, ne virtutes sileantur, utque pravis dictis factisque ex posteritate et infamiâ metus sit:" that it is incumbent on the writer to rejudge the actions of men, to the end that the good and worthy may meet with the reward due to eminent virtue, and that pernicious citizens may be deterred by the condemnation that waits on evil deeds at the tribunal of posterity. In this consists the chief part of the historian's duty.

Let it be remembered that in this country, it is an indispensable duty of every man of liberal birth, to be acquainted in a certain degree with the science of politics. History is the school of politics: it unfolds to us the springs of human affairs; the causes of the rise, grandeur, revolutions, and fall of empires. It points out the reciprocal influence of government and of national manners: it dissipates prejudices, nourishes the love of our country, and directs to the best means of improvement. It illustrates equally the blessings of political union and the miseries of faction.

As to the events that stand recorded in history, says Lord Bolingbroke, we see them all, we see them as they followed one another, or as they produced one another, causes or effects, immediate or remote. We are cast back, as it were, into former ages; we live with the men who lived before us, and we inhabit countries that we never saw. Place is enlarged, and time prolonged in this manner; so that the man who applies himself early to the study of history may acquire in a few years, and before he sets his foot abroad in the world, not only a more extended knowledge of mankind, but the experience of more centuries than any of the patriarchs saw. The events we are witnesses of in the course of the longest life, appear to us very often original, unprepared, simple, and unrelative; they appear such very often, are called accidents, and looked upon as the effects of chance: experience can carry us no farther, for experience can go a very little way back in discovering causes; and effects are not the objects of experience till they happen. Hence many errors in judgment, and by consequence in conduct, necessarily arise; and here too lies the difference we are speaking of between history and experience: the advantage on the side of the former is double. In ancient history the examples are complete, which are incomplete in the course of experience; experience is doubly defective; we are born too late to see the beginning, and we die too late to see the end of many things. History supplies both these defects. Modern history shews the causes, when experience presents the effects alone; and ancient history enables us to guess at the effects when experience presents the causes alone.

HI'STORY PIECE. *s.* A picture representing some memorable event (*Pope*).

HISTRIO, in the ancient drama, signified an actor or comedian; but more especially a pantomime, who exhibited his part by gestures and dancing. Livy informs us, that the histriones were brought to Rome from Etruria, in the year of the city 391. (Dec. i. lib. 7.)

HISTRIO'NICAL. HISTRIO'NIC. *a.* (from *histrio*, Lat. *histrion*, Fr.) Befitting the stage; suitable to a player; becoming a buffoon; theatrical.

HISTRIO'NICALLY. *ad.* (from *histrionical.*) Theatrically; in the manner of a buffoon.

HISTRIX. See HYSTRIX.

To HIT. *v. a.* (from *hitte*, Danish.) 1. To strike; to touch with a blow (*South*). 2. To

touch the mark; not to miss (*Sidney*). 3. To attain; to reach; not to fail (*Atterb.*). 4. To suit; to be conformable to (*Milton*). 5. To strike; to touch properly (*Dryden*). 6. *To* HIT *off*. To strike out; to fix or determine luckily (*Temple*). 7. *To* HIT *out*. To perform by good luck (*Spenser*).

To HIT. *v. n.* 1. To clash; to collide. (*Locke.*) 2. To chance luckily; to succeed by accident; not to miss (*Bacon*). 3. To succeed; not to miscarry (*Bacon*). 4. To light on (*Tillotson*).

HIT. *s.* (from the verb.) 1. A stroke (*Shakspeare*). 2. A chance; a fortuitous event (*Glanville*). 3. A lucky chance (*Shakspeare*).

To HITCH. *v. n.* (hiezan, Saxon, or *hocher*, French.) To catch; to move by jerks (*Pope*).

To HI'TCHEL. *v. a.* See HATCHEL. To beat or comb flax or hemp.

H'ITCHEL. *s.* (*heckel*, German.) The instrument with which flax is beaten or combed.

HITCHIN, a town in Hertfordshire, with a market on Tuesday. The manor was the ancient demesne of the kings of England, as it continues at this day. The inhabitants now make large quantities of malt, and the market, which is held on Tuesday, is one of the greatest in England for wheat. Lat. 51. 58 N. Lon. 0. 10 W.

HITHE, a town of Kent, in England, 70 miles from London. It is one of the cinque ports; and had formerly five parishes, but by the choaking up of its harbour and other accidents these are now reduced to one. In the reign of Henry IV. numbers of its inhabitants were cut off by a pestilence, 200 of their houses consumed by fire, and five of their ships sunk at sea, with the loss of 100 men; so that the people were going to abandon the town, had not the king by his charter generously released to them, for five turns next following, their service of five ships of 100 men and five horse, which they were to have furnished out and kept at their own charge in the king's wars for 15 days. It was first incorporated by the name of barons of the town and port of Hith; but the government was afterwards changed. It was incorporated by Queen Elizabeth with the name of the mayor, jurats, and commonalty of the town and port of Hith, who, with the freemen, elect the members of parliament. The mayor is chosen yearly on Candlemas-day. is a market on Saturdays, and fairs in nd December. Lat. 51. 8 N. Lon 1. 10 E.

HITHE. *s.* (hyðe, Saxon.) A small haven to land wares out of vessels or boats.

HI'THER. *ad.* (hiðeր, Saxon.) 1. To this place from some other (*Milton*). 2. *Hither* and *thither*, to this place and that. 3. To this end; to this design (*Tillotson*).

HI'THER. *a.* superl. *hithermost*. Nearer; toward this part (*Hale*).

HI'THERMOST. *a.* (of *hither, adv.*) Nearest on this side (*Hale*).

HI'THERTO. *ad.* (from *hither.*) 1. To this time; yet (*Dryden*). 2. In any time till now (*Spenser*). 3. At every time till now (*Dryden*).

HI'THERWARD. HI'THERWARDS. *ad.* (hyðeրpeaրd, Saxon.) This way; toward this place (*Milton*).

HITTITES, the descendants of Heth, the father of the Hittites. Heth was the eldest son of Canaan, (Gen. x. 15.) who dwelt southward of the Promised Land, at Hebron, or thereabout. Ephron, an inhabitant of Hebron, was of the race of Heth, and this whole city in Abraham's time was peopled by the children of Heth.

HIVE. *s.* (hyfe, Saxon.) 1. The habitation or artificial receptacle of bees (*Addison*). 2. The bees inhabiting a hive (*Shakspeare*). 3. A company being together (*Swift*).

To HIVE. *v. a.* (from the noun.) 1. To put into hives; to harbour (*Dryden*). 2. To contain as in hives (*Cleaveland*).

To HIVE. *v. n.* To take shelter together; to reside collectively (*Pope*).

HI'VER. *s.* (from *hive.*) One who puts bees in hives (*Mortimer*).

HIVITES, a people descended from Canaan. They dwelt at first in the country which was afterwards possessed by the Caphtorims, or Philistines. There were Hivites likewise at Shechem and Gibeon, and consequently in the centre of the Promised Land; for the inhabitants of Shechem and the Gibeonites were Hivites, (Josh. xi. 19. Gen. xxxiv. 12.) Lastly, there were some beyond Jordan, at the foot of mount Hermon, (Josh. xi. 3.) Bochart is of opinion, that Cadmus, who carried a colony of Phœnicians into Greece, was an Hivite. His name Cadmus, comes from the Hebrew Kedem, "the east," because he was of the eastern part of the land of Canaan. The name of his wife Hermione, comes from mount Hermon, at the foot whereof the Hivites had their dwelling. The metamorphosis of Cadmus's companions into serpents is grounded on the signification of the name Hivites, which in Phœnician signifies "serpents."

HO, HOA. *interj.* (*eho!* Latin.) A call; a sudden exclamation to give notice of approach, or any thing else (*Shakspeare*).

HOADLEY (Benjamin), a learned English prelate, was born at Westerham in Kent, in 1676, and educated at Catherine-hall, Cambridge, of which he afterwards became fellow. In 1706 he commenced his literary, or rather his polemical career, by some remarks on Dr. Atterbury's funeral sermon for Mr. Bennet; and in 1708 he answered another sermon of the same author on the Power of Charity to cover Sin. The year following he had a controversy with Atterbury on the doctrine of non-resistance, which recommended Hoadley to the notice of the house of commons, who prayed the queen to grant him preferment for his services in the cause of liberty. Soon after the accession of George I. he was made bishop of Bangor, which see he never visited, but continued in London preaching and publishing party-sermons. One of these on the Spiritual Kingdom of Christ, and asserting the temporal jurisdiction of the clergy, produced a long and violent debate, called the Bangorian con-

troversy. He was afterwards engaged in a dispute with Dr. Hare on the nature of prayer, which, however, was of short duration. From Bangor he was removed to Hereford, thence to Salisbury, and lastly to Winchester. In 1735 he published his Plain Account of the Lord's Supper, which he resolved into a matter of mere indifference. This excited another controversy, in which he had the ingenious William Law for his antagonist, who proved more than a match for the bishop. Dr. Hoadley died in 1761.

Hoadley (Benjamin), an ingenious physician, was the eldest son of the preceding, and was born at London in 1705. He received his academical education at Cambridge, under Mr. Herring, afterwards archbishop of Canterbury. Here he took his first degree in physic, and in 1728 was created doctor in that faculty by mandamus. In 1742 he was appointed physician to his majesty's household, and to that of the prince of Wales in 1745. He died in 1757. His works are; 1. Some Lectures on the Organ of Respiration, before the College of Physicians; 2. The Suspicious Husband, a comedy; 3. Observations on a Series of Electrical Experiments, &c.

HOANG-TCHEOU-FOU, a populous and commercial city of China, in the province of Hou-quang. Its district contains one city of the second, and two of the third class. Lat. 38. 30 N. Lon. 114. 27 E.

HOAR. *a.* (hap, Saxon.) 1. White (*Fairfax*). 2. Gray with age (*Pope*).

Hoar-frost. *s.* (*hoar* and *frost.*) The congelations of dew in frosty mornings on the grass (*Arbuthnot*)

HOARD. *s.* (hopd, Saxon.) A store laid up in secret; a hidden stock, a treasure (*Sh.*).

To Hoard. *v. n.* To make hoards; to lay up store (*Shakspeare*).

To Hoard. *v. a.* To lay in hoards; to husband privily; to store secretly (*Rogers*).

HOA'RDER. *s.* (from *hoard.*) One that stores up in secret (*Locke*).

HOA'RHOUND. *s.* A plant (*Hill*).

HOA'RINESS. *s.* (from *hoary.*) The state of being whitish; the colour of old men's hair (*Dryden*).

HOARSE. *a.* (hap, Saxon.) Having the voice rough, as with a cold; having a rough sound (*Shakspeare*).

HO'ARSELY. *ad.* (from *hoarse.*) With a rough harsh voice (*Dryden*).

HOA'RSENESS. *s.* (from *hoarse.*) Roughness of voice (*Holder*).

HO'ARY. *a.* (hap, hapung, Saxon.) 1. White; whitish (*Addison*). 2. White or gray with age (*Rowe*). 3. White with frost (*Shaks.*). 4. Mouldy; mossy; rusty (*Knolles*).

Hoary leaf. In botany, folium incanum. Covered with a white pubescence; as in draba incana, cistus incanus.

HOBBES (Thomas), an English philosopher, was born at Malmsbury, in Wiltshire, in 1588, and educated at Magdalen-hall, Oxford. In 1608 he became tutor to William Lord Cavendish, son of the Earl of Devonshire, with whom he made the tour of Europe. On the death of his patron and pupil he became travelling tutorto a young gentleman; but the countess dowager of Devonshire recalled him into her family to take upon him the education of the young earl, which trust he discharged with great fidelity. In 1634 he reprinted his translation of Thucydides, the first edition of which had appeared in 1628. The same year he attended the earl on his travels, and at Pisa contracted an intimacy with Galileo. In 1637 he returned with his pupil to England, and soon afterwards the Scottish troubles broke out, which set Hobbes on writing his book, De Cive, which he afterwards amplified into his Leviathan. In 1640 he went over to France, and became acquainted with Des Cartes and Gassendi. In 1642 he printed a small edition of his book, De Cive, which brought him many enemies, on account of its dangerous principles. His patron, sir Charles Cavendish, afterwards duke of Newcastle, recommended him to be mathematical tutor to the prince of Wales, afterwards Charles II. in which capacity he gave great satisfaction. In 1650 appeared, in English, his book on Human Nature; and one, De Corpore Politico, or the Elements of the Law. Shortly after came out his Leviathan, dedicated to the king, who was dissuaded from giving it any countenance, and certainly the principles of it warranted that advice. He afterwards engaged in a dispute with Dr. Wallis on the subject of mathematics, in which Hobbes came off very indifferently. On the restoration of the king he received a pension; but in 1666 the parliament passed a censure on his writings, which alarmed him greatly. In 1674 he published a translation into English of part of the Odyssey, the reception of which was such that he went through with that poem, and also the Iliad. He had before given some tokens of a poetic turn in a Latin poem, entitled, De Mirabilibus Pecci, or of the Wonders of the Peak. The earl of Devonshire remained his constant patron, and Hobbes lived in the family to his death, which happened in 1679. Dr. White Kennet informs us that "he used to say, it was lawful to make use of ill instruments to do ourselves good: 'If I were cast (says he) into a deep pit, and the devil should put down his cloven foot, I would take hold of it to be drawn out by it.' After the Restoration he watched all opportunities to ingratiate himself w the king and his prime ministers; and looked upon his pension to be more valuable as an earnest of favour and protection, than upon any other account. His future course of life was to be free from danger. He could not endure to be left in an empty house. Whenever the earl removed, he would go along with him, even to his last stage, from Chatsworth to Hardwick. When he was in a very weak condition, he dared not to be left behind; but made his way upon a feather-bed in a coach, though he survived the journey but a few days. He could not bear any discourse of death, and seemed to cast off all thoughts of it: he de-

lighted to reckon upon longer life. The winter before he died, he made a warm coat, which he said must last him three years, and then he would have such another. In his last sickness his frequent questions were, Whether his disease was curable? and when intimations were given, that he might have ease, but no remedy, he used this expression, 'I shall be glad to find a hole to creep out of the world at;' which are reported to have been his last sensible words; and his lying some days following in a silent stupefaction, did seem owing to his mind more than to his body."

The following original letter from Dr. John Wallis, the mathematician, to Mr. (afterwards Archbishop) Tenison, containing some remarks on Mr. Hobbes and his writings, will doubtless be acceptable to many of our readers:

Oxford, November 30, 1680.

SIR,

I received your's of the 25th of November, and approve the design. The Life you speak of, I have not seen, nor do I know that I ever saw the man (Mr. Hobbes.) Of his writings, I have read very little save what relates to mathematics. By that I find him to have been of a bold and daring fancy to venture at any thing, but he wanted judgment to understand the consequence of an argument, and to speak consistently with himself. Whereby his argumentations which he pretends to be demonstrative, are very often but weak and incoherent discourses, and destructive in one part of what is said in another, sometimes within the compass of the same page or leaf. This is more convincingly evident (and unpardonable) in mathematics, than in other discourse, which are things capable of cogent demonstration and so evident that, though a good mathematician may be subject to commit an error) yet one who understands but little of it, cannot but see a fault when it is shewn him. For (they are his own words: Leviathan part 1. cap 5. p. 21.) 'who is so stupid as both to mistake in geometry, and also to persist in it when another detects his error to him?' Now when so many hundred paralogisms and false propositions have been shewed him in his mathematics by those who have written against him, and that so evidently that no one mathematician at home or abroad (no, not those of his intimate friends, have been found to justify him in any one of them, which makes him somewhere say of himself, 'Aut ego solus insanio, aut solus non insanio,' he hath been yet so stupid (to use his own word) to persist in them, and to repeat and defend them: particularly he hath first and last given us near twenty quadratures of the circle, of which some few, though false, have been coincident (which therefore I repute for the same only differently disguised, but more than a dozen of them are such as no two of them are consistent; and yet he would have them thought to be all true. Now either he thought so himself (and then you must take him to be a person of a very shallow capacity, and not such a man of reason as he would be thought to be;) or else, *knowing them to be false, was obstinately resolved* notwithstanding to maintain them as true, (and he must then be a person of no faith, or honesty;) and if he argues at this rate in mathematics, what are we to expect in his other discourses?

"Nor am I the first who have taken notice of his incoherent way of discourse and illogical inferences. Mr. Boyle, in his Examen of Mr. Hobbes's Dialogus Physicus de Naturâ Aëris, p. 15, (and I think elsewhere, though I do not remember the place) refers to Dr. Ward's Dissertatio in Philosophiam Hobbianam, p. 188, who voucheth Des Cartes to the same purpose; 'Nempe hoc est quod alicubi admiratus est magnus Cartesius nusquam eum, sive verum, sive falsum posuerit, recte aliquid ex Suppositionibus Academiarum,' against one Webster with some animadversions on Mr. Hobbes. He had in his younger days some little insight in mathematics, and which, at that time, (when few had any) passed for a great deal. On the credit of which he did much bear up himself as a great man, and having somewhat singular; and thereupon despised divines as not being philosophers or not mathematicians, without which he would have thought it impossible to do any good in philosophy; De Corpore cap. 6. sect. 6—and so long as he did but talk and forbear to write, he did by his own report pass for a mathematician; but when once he began to write mathematics, he presently fell into those gross absurdities, and discovered in himself such an incapacity for it, as could not have been imagined of him if he had forborne to write: and truly I look upon it as a great providence that God should leave him to so great a degree of infatuation, in that wherein he did so much pride himself. For whereas in discourses of other subjects, mistakes may be shuffled over with a multitude of great words, in mathematics it cannot be so; and hereby he discovered himself (without possibility of palliation,) not to be that man of reason he would be thought to be. For though a man may be rational who is not a mathematician, (and had he not pretended to it, his ignorance had been excusable) but for so great a pretender, and who had gloried in it for so long a time, and was acquainted with the principles of it, from such principles to infer such absurd conclusions, must needs argue a want of logic, and an incapacity not only to reason well, but even to understand reason. And I guess it was his affectation of singularity (as much as any thing) which made him engage in atheistical tenets, that he might seem to be a man of greater reach than all the world besides. I know not what to add more, but if this may contribute any thing to your satisfaction, it is at your service. Your's to serve you,

"JOHN WALLIS."

HOBBIMA (Minderhout), an eminent painter of landscapes, born at Antwerp about 1611. He studied wholly after nature, and his choice was exceedingly picturesque, but his works are now very scarce.

To HO'BBLE. *v. n.* (to *hop*, to *hopple*, to

hobble.) 1. To walk lamely or awkwardly upon one leg more than the other; to hitch (*Swift*). 2. To move roughly or unevenly (*Prior*).

Ho'BBLE. *s.* (from the verb.) Uneven awkward gait (*Swift*).

HO'BBLINGLY. *ad.* (from *hobble.*) Clumsily; awkwardly; with a halting gait.

HO'BBY. *s.* (*hobereau*, French.) 1. A species of hawk. See FALCO. 2. (*hoppe*, Gothick) An Irish or Scottish horse; a pacing horse; a garran. 3. A stick on which boys get astride, and ride (*Prior*). 4. A stupid fellow (*Shakspeare*).

HOBGOBLIN, a name vulgarly applied to fairies and apparitions.

HOBIT, a small mortar. See HOWITZER.

HOBLERS, a name formerly given to certain Irish knights who used to serve as light horsemen upon hobbies.

HO'BNAIL. *s.* (from *hobby* and *nail.*) A nail used in shoeing a little horse (*Shakspeare*).

HO'BNAILED. *a.* Set with hobnails (*Dryden*).

HO'BNOB. Corrupted from *habnab* (*Sh.*).

HOBSHEE-COFFREES, a kind of slaves very frequent in the empire of Hindustan. They come mostly from a province subject to the Negus of Ethiopia, called Innariah, to the south of his other dominions, and bordering upon Negroland in Africa.

HOBSON'S CHOICE, a vulgar proverbial expression, applied to that kind of choice in which there is no alternative. It is derived from the name of a carrier at Cambridge, who let out hackney horses, and obliged each customer to take in his turn that horse which stood next the stable-door. Hobson died Jan. 1, 1630, while the plague was in London, and Milton wrote two epigrammatic epitaphs on the occasion, both of which are preserved in his Miscellanies. Till very lately there was a fine picture of Hobson, at the Bull, in Bishopsgate-street, London: where it is now we know not.

HOCHBERG, a marquisate of Brisgaw, in Germany, in the circle of Suabia. It belongs to the Prince of Baden Dourlach.

HOCHSTET, a town of Germany, in the circle of Suabia, remarkable for the great battle gained near it by the Duke of Marlborough in 1704, and which the English call the battle of Blenheim, from a village of that name three miles S. W. of this. It is seated on the Danube. Lat. 48. 38 N. Lon. 10. 33 E.

HOCK, the hough of a horse or other quadruped: the joint of the leg behind, corresponding with the knee in front. Its office, in sustaining the principal weight and various turns of the body, renders it liable to injuries of a peculiar kind, which are often severe and permanent. Bone-spavins, blood-spavins and curbs are of this description.

To HOCK. *v. a.* To disable in the hock.

HOCK, HO'CKAMORE. *s.* (from *Hockheim* on the *Maine.*) Old strong Rhenish wine (*Floyer*).

HO'CKHERB. *s.* (*hock* and *herb.*) A plant, the same with mallow (*Ainsworth*).

To HO'CKLE. *v. a.* (from *hock.*) To hamstring (*Hanmer*).

HOCUS POCUS. (*Junius* derives it from *hocced*, Welsh, a cheat, and *poke* or *pocus*, a bag.) A juggle; a cheat (*L'Estrange*).

HOD. *s.* A kind of trough in which a labourer carries mortar to the masons. The same word is often used in the fens of Huntingdonshire, &c. to denote a kind of turf used as fuel.

HODDESDON, a town in Hertfordshire, with a market on Thursdays. It is seated near the Lea. Lat. 51. 49 N. Lon. 0. 5 E.

HODGE-PODGE. (*haché poché*, Fr.) A medley of ingredients boiled together (*Sandys*).

HODIE'RNAL. *a.* (*hodiernus*, Latin.) Of to-day.

HO'DMAN. *s.* (*hod* and *man.*) A labourer that carries mortar.

HOE, a husbandman's tool, somewhat like a cooper's adze, to cut up weeds in gardens, fields, &c. This instrument is of great use, and ought to be much more employed than it is in hacking and clearing the several corners and patches of land in spare times of the year, which would be no small advantage to the soil.

HOECK (John van), an historical and portrait painter, was born at Antwerp in 1600. He studied under Rubens, and afterwards visited Rome, where he gained the patronage of several of the cardinals and other great personages. At the solicitation of Ferdinand II. he went to Vienna, where he was greatly distinguished by the imperial family. He died in 1650. (*Watkins*).

HOEI-TCHEOU, the most southern city of the province of Kiang-nan of China, and one of the richest of the empire. The people are economical and temperate, but they are active and enterprising in trade. They boast of their tea, varnish, and engravings, which are indeed the most esteemed in China.

HOEI-TCHEOU-FOU, a commercial city of China, in the province of Quang-tong. Its jurisdiction contains 11 cities of the 2d and 3d class. Lat. 23. 1 N. Lon. 113. 58 E.

HOEING, in the new husbandry, is the breaking or dividing the soil by tillage while the corn or other plants are growing thereon. It differs from common tillage (which is always performed before the corn or plants are sown or planted) in the time of performing it; and it is much more beneficial to the crops than any other tillage. This sort of tillage is performed various ways, and by means of different instruments. See HUSBANDRY.

HOEL (Gerard), an historical and landscape painter, born at Bommel in 1648. He settled at Utrecht, where he was appointed director of an academy for drawing and painting. Many capital pictures of his are in the palace of Stargenberg, and his eminent talents may be seen in the grand staircase of the seat of the Earl of Albemarle. He died in 1733.

HOFFMAN (Maurice), an eminent phy-

sician, born in the electorate of Brandenburg, in 1621. After studying under his uncle, who was professor of physic at Altdorf, he went to Padua, where he took his doctor's degree. In 1648 he was made professor-extraordinary in anatomy and surgery at Altdorf, and the year following professor of physic. In 1653 he obtained the professorship of botany, to which was added the direction of the physic-garden. He died in 1698. His works are, 1. Altdorfi deliciæ Hortenses; 2. Appendix de Catalogum Plantarum Hortensium; 3. Deliciæ silvestres; 4. Florigeium Altdorfinum. His son John Maurice Hoffman was also an eminent physician, as well as a good botanist.

HOFFMA'NNIA. In botany, a genus of the class tetrandria, order monogynia. Calyx four-toothed; corol salver-shaped, four-parted; filamentless; berry two-celled, many-seeded, inferior. One species; an herbaceous plant of Jamaica.

HOG. *s.* (*hwch*, Welsh.) 1. The general name of swine. See Sus. 2. A castrated boar. 3. *To bring* Hogs *to a fine market.* To fail of one's design (*Spectator*).

Hog, on board a ship, is a sort of flat scrubbing-broom, formed by inclosing a number of short twigs of birch or such wood between two pieces of plank fastened together, and cutting off the ends of the twigs. It is used to scrape the filth from a ship's bottom under water, particularly in the act of boot-topping. For this purpose they fit to this broom a long staff with two ropes; one of which is used to thrust the hog under the ship's bottom, and the other to guide and pull it up again close to the planks.

HOG'S-LARD. See Axungia.

HOGARTH (William), a celebrated English artist, was born at London in 1698, and bound apprentice to an engraver of arms on silver plate. About 1720 he set up business for himself, and his first employment was to engrave coats of arms and shop-bills. He next undertook to execute plates for booksellers, the chief of which are a set of prints to illustrate Hudibras in 1726. His first performance as a painter was a representation of Wanstead assembly, the portraits taken from life, but without burlesque. In 1730 he married a daughter of Sir James Thornhill, and shortly after embellished the gardens of Vauxhall with some excellent paintings, for which Mr. Tyers, the proprietor, complimented him with a golden ticket of admission for himself and friends. In 1733 appeared his Harlot's Progress, a set of prints which at once stamped his reputation, and which was followed by other moral histories, most strikingly executed. Soon after the treaty of Aix-la-Chapelle he went over to France, and while at Calais began to sketch a drawing of the gate of the town, for which he was taken up, but at last obtained his discharge. This circumstance gave rise to his piece of, O the roast Beef of Old England! and it is observable that he never after exhibited a Frenchman but in caricature. In 1753 he published his Analysis of Beauty, in a 4to. volume, in which work he was greatly assisted by Dr. Benjamin Hoadley the physician, and Dr. Morell. Hogarth had the infirmity of excessive vanity, and thought himself the first painter of the age. He was also a very absent man; an instance of which happened as follows: Soon after he had set up his carriage, he paid a visit to the lord mayor, and having protracted his visit for a considerable time till a heavy shower came on, he was let out by a different door from that by which he entered. Unmindful of his own carriage, he called for a coach, but finding none was to be had he set off through the rain, and got home dripping wet. When Mrs. Hogarth asked him where he had left the carriage, he said that he had forgot it. The last remarkable incident of his life was a dispute with Churchill the poet, who attacked him in a poetical epistle for his abuse of his friend Mr. Wilkes. Hogarth retaliated by representing the satirist in the form of a bear dressedly canonically, holding a pot of porter in his paw. He died of a lingering illness in 1762, and was interred in the church-yard of Chiswick.

A specimen of Hogarth's propensity to merriment, on the most trivial occasions, is observable in one of his cards requesting the company of Dr. Arnold King to dine with him at the Mitre. Within a circle, to which a knife and fork are the supporters, the written part is contained. In the centre is drawn a pie, with a mitre on the top of it: and the invitation of our artist concludes with the following words in Greek letters—to *Eta Beta Pi*. The rest of the inscription is not very accurately spelled. A quibble by Hogarth is surely as respectable as a conundrum by Swift.

HO'GCOTE. *s.* (*hog* and *cote*.) A house for hogs; a hog-sty (*Mortimer*).

HO'GGEREL. *s.* A two-year-old ewe (*Ainsworth*).

HO'GH. *s.* (otherwise written *ho*, from *hoogh*, Dutch.) A hill; rising ground (*Spen.*).

HO'GHERD. *s.* (*hog* and hyrd, a keeper.) A keeper of hogs (*Broome*).

HO'GGISH. *a.* (from *hog*.) Having the qualities of a hog; brutish; selfish (*Sidney*).

HO'GGISHLY. *ad.* Greedily; selfishly.

HO'GGISHNESS. *s.* (from *hoggish*.) Brutality; greediness; selfishness.

HOGSHEAD, in commerce, a measure of capacity for liquids. The hogshead of wine contains 63 gallons, each of 231 cubic inches: the hogshead of beer 54 gallons of 282 cubic inches each. In Scotland a hogshead contains 16 gallons.

HO'GSTY. *s.* (*hog* and *sty*.) The place in which swine are shut to be fed (*Swift*).

HO'GWASH. *s.* (*hog* and *wash*.) The draff which is given to swine (*Arbuthnot*).

HOGUE, CAPE LA, on the N.W. point of Normandy, near which Admiral Rooke burnt 13 French men of war in 1692. Lat. 49. 45 N. Lon. 1. 52 W.

HOHENZOLLERN, a town of Suabia, capital of a county of the same name, with a

castle. It is seated on a mountain. Lat. 48. 24 N. Lon. 9. 6 E.

HOI'DEN. *s.* (*hoeden*, Welsh.) An ill-taught awkward country girl.

To HOI'DEN. *v. n.* (from the noun.) To romp indecently (*Swift*).

To HOISE. *To* HOIST. *v. a.* (*hausser*, Fr.) To raise up on high (*Chapman*).

HOKE-DAY, HOCK-DAY, or HOCK-TUESDAY, in our ancient customs (dies Martis, quem quindenam paschæ vocant), the second Tuesday after Easter week; a solemn festival celebrated for many ages in England in memory of the great slaughter of the Danes in the time of king Ethelred, they having been in that reign almost all destroyed in one day in different parts of the kingdom, and that principally by women. This is still kept up in some counties; and the women bear the principal sway in it, stopping all passengers with ropes and chains, and exacting some small matter from them to make merry with.

HO-KIEN-FOU, a city of China, and one of the principal in the province of Pe-tcheli. It has two cities of the second, and fifteen of the third class, in its district, but is remarkable for nothing but the neatness of its streets. Lat. 38. 28 N. Lon. 115. 43 E.

HOLBEACH, a town in Lincolnshire, with a market on Thursdays. Lat. 52. 47. N. Lon. 0. 11 E.

HOLBECK, a seaport of Denmark, in the island of Zealand, with a good harbour. Lat. 55. 42 N. Lon. 11. 44 E.

HOLBEIN (John or Hans), a famous painter, was born at Basil in Switzerland in 1498, and was instructed in the principles of his art by his father. In the town-house of Basil he painted a fine picture of our Saviour's Passion; and in the fish market of the same town, a dance of peasants, and Death's dance, the last of which has been engraved in a series of plates. In the reign of Henry VIII. he came to England, where he was patronized by sir Thomas More and other great men. He was also taken into the service of the king, and painted a vast number of portraits and historical pieces in an excellent style. On the report of this painter's character, a lord of the first quality came to see him when he was drawing a figure after the life. Holbein sent to desire his lordship to defer the honour of his visit to another day; which the nobleman taking for an affront, broke open the door, and very rudely went up stairs. Holbein, hearing a noise, came out of his chamber; and meeting the lord at his door, fell into a violent passion, and pushed him backwards from the top of the stairs to the bottom. However, immediately reflecting on what he had done, he escaped from the tumult he had raised, and made the best of his way to the king. The nobleman, much hurt, though not so much as he pretended, was there soon after him; and upon opening his grievance, the king ordered Holbein to ask his pardon. But this only irritated the nobleman the more, who would not be satisfied with less than his life; upon which the king sternly replied, "My lord, you have not now to do with Holbein, but with me: whatever punishment you may contrive by way of revenge against him, shall certainly be inflicted on yourself. Remember, pray, my lord, that I can whenever I please make seven lords of seven ploughmen, but I cannot make one Holbein of even seven lords." Holbein died of the plague at his lodgings at Whitehall in 1554.

HOLCUS. Soft grass. In botany, a genus of the class polygamia, order monœcia. Herm.: calyx glume two-valved; one or two-flowered; corol glume two-valved, awned; stamens three; styles two; seed one. Male: calyx glume two-valved; corolless; stamens three. Fifteen species: chiefly natives of India, a few of America, and two common to our own country. The following are all we can notice.

1. H. sorghum. Millet. Glumes villous, seeds compressed, awned. It produces the true culinary millet-seed; and is a native both of India and Guinea. In the latter country, and especially on the banks of the Senegal, the fields are frequently covered with it, and the stalk rises to eight feet in height. The flour makes excellent bread; and from the quantity of saccharine matter contained in the sap, it is probable that an excellent sugar might be obtained from it at a cheap expence.

2. H. mollis. Glumes partly naked; hermaphrodite plant awnless; male with a sharply-bent awn; root creeping. Common to our own hedges.

3. H. lanatus. Glumes villous; hermaphrodite floret awnless; male with an arch recurved awn. Found in our pastures.

HOLD, in veterinary language, is a term applied to the mare after copulation, and means that she retains the male semen. See RETAIN. The mare being brought to the horse on the ninth day, from the first time of covering, if she again receive him the act is accounted a sufficient proof she did not hold or retain before: she is, nevertheless, brought again to the horse at the end of another nine days, and when she has twice refused to take him, she is said to be stinted, and no doubt is entertained of her being with foal.

To HOLD. *v. a.* preter. *held*; part. pass. *held* or *holden*. (healdan, Saxon.) 1. To grasp in the hand; to gripe; to clutch (*Shakspeare*). 2. To keep; to retain (*Spenser*). 3. To connect; to keep together (*Exodus*). 4. To maintain as an opinion (*Locke*). 5. To consider; to regard (*Shakspeare*). 6. To think of; to judge with regard to praise or blame (*Dryden*). 7. To receive, and keep in a vessel (*Milton*). 8. To contain; to receive into its capacity: as, *a hogshead* holds *sixty-three gallons*. 9. To have any station (*Milton*). 10. To possess; to have (*Knolles*). 11. To possess in subordination (*Knolles*). 12. To suspend; to refrain (*Crashaw*). 13. To stop; to restrain (*Denham*). 14. To fix in any condition (*Shak.*). 15. To keep; to save (*Shakspeare*). 16. To confine to a certain state (*Esdras*). 17. To detain; to keep in subjection (*Acts*). 18. To

retain; to continue (*Dryden*). 19. To practise with continuance (*Milton*). 20. To solemnize; to celebrate (*Samuel*). 21. To conserve; not to infringe (*Dryden*). 22. To manage; to handle intellectually (*Bacon*). 23. To maintain (*Maccabees*). 24. To carry on conjunctively (*Matthew*). 25. To prosecute; to continue (*Abbot*). 26. *To* HOLD *forth.* To offer to exhibit; to propose (*Temple*). 27. *To* HOLD *forth.* To protend; to put forward to view (*Cheyne*). 28. *To* HOLD *in.* To restrain (*Swift*). 29. *To* HOLD *off.* To keep at a distance (*Shakspeare*). 30. *To* HOLD *on.* To continue; to protract; to push forward (*Sanderson*). 31. *To* HOLD *out.* To extend; to stretch forth (*Esther*). 32. *To* HOLD *out.* To offer; to propose. 33. *To* HOLD *out.* To continue to do or suffer (*Shakspeare*). 34. *To* HOLD *up.* To raise aloft (*Locke*). 35. *To* HOLD *up.* To sustain; to support (*Shakspeare.*)

To HOLD. *v. n.* 1. To stand; to be right; to be without exception (*Stillingfleet*). 2. To continue unbroken or unsubdued (*Shakspeare*). 3. To last; to endure (*Bacon.*) 4. To continue without variation (*Milton.*) 5. To refrain: *he* held *from tears* (*Dryden*). 6. To stand up for; to adhere (*Hale*). 7. To be dependant on (*Ascham*). 8. To derive right (*Dryden*). 9. *To* HOLD *forth.* To harangue; to speak in public (*L'Estrange*). 10. *To* HOLD *in.* To restrain one's self (*Jer.*). 11. *To* HOLD *in.* To continue in luck (*Swift*). 12. *To* HOLD *off.* To keep at a distance without closing with offers (*Decay of Piety*). 13. *To* HOLD *on.* To continue; not to be interrupted (*Swift*). 14. *To* HOLD *on.* To proceed (*L'Estrange*). 15. *To* HOLD *out.* To last; to endure (*Arbuthnot*). 16. *To* HOLD *out.* Not to yield; not to be subdued (*Collier*). 17. *To* HOLD *together.* To be joined (*Dryd.*). 18. *To* HOLD *together.* To remain in union. 19. *To* HOLD *up.* To support himself (*Tillotson*). 20. *To* HOLD *up.* Not to be foul weather. 21. *To* HOLD *up.* To continue the same speed (*Collier*).

HOLD. *interj.* Forbear; stop; be still (*Dryden*).

HOLD. *s.* (from the verb.) 1. The act of seizing; gripe; grasp; seizure (*Spenser*). 2. Something to be held; support (*Bacon*). 3. Catch; power of seizing (*Shakspeare*). 4. Prison; place of custody (*Hooker*). 5. Custody (*Shakspeare*). 6. Power; influence (*Dryden*). 7. A lurking place. 8. A fortified place; a fort (*Spenser*).

HOLD, in music, the name originally given to that curve or arch with a point under it, which we now term a pause.

HOLD, the whole interior cavity or belly of a ship, or all that part of her inside which is comprehended between the floor and the lower-deck, throughout her whole length. This capacious apartment usually contains the ballast, provisions, and stores of a ship of war, and the principal part of the cargo in a merchantman. The disposition of these articles with regard to each other, naturally falls under consideration in the article STOWAGE; it suffices in this place to say, that the places where the ballast, water, provisions, and liquors are stowed, are known by the general name of the hold. The several store-rooms are separated from each other by bulk-heads, and are denominated according to the articles which they contain, the sail-room, the bread-room, the fish-room, the spirit-room, &c.

HOLDER (William), a learned divine, was born in Nottinghamshire, and educated in Pembroke-hall, Cambridge. In 1642 he became rector of Blechingdon, Oxfordshire. At the restoration he took his doctor's degree, became fellow of the Royal Society, and subalmoner to the king. He had great skill in teaching the deaf and dumb to speak, on which art he wrote a treatise. He was also well skilled in music, and published a treatise on the Natural Grounds and Principles of Harmony, 1694, 8vo. His other works are; a Discourse concerning Time, with Application of the natural Day, lunar Month, and solar Year, 8vo.; and some papers against Dr. Wallis. He died in 1697.

HO'LDER. *s.* (from *hold.*) 1. One that holds or gripes any thing in his hand (*Mortimer*). 2. A tenant; one that holds lands under another (*Carew*).

HOLDERFO'RTH. *s.* (*hold* and *forth.*) An haranguer; one who speaks in public (*Addison*).

HOLDERNESS, a division of the East riding of Yorkshire, which has a very rich soil, and is remarkable for its large breed of horned cattle and horses.

HOLD-FAST. *s.* (*hold* and *fast.*) Any thing which takes hold; a catch; a hook (*Ray*).

HO'LDING. *s.* (from *hold.*) 1. Tenure; farm (*Carew*). 2. It sometimes signifies the burden or chorus of a song (*Shakspeare*).

HOLDSWORTH (Edward), an elegant scholar, was born about 1688, and educated at Winchester school, from whence he was elected demy of Magdalen college, Oxford, where he took his degrees of arts. He afterwards became travelling tutor to young noblemen and gentlemen, and died at Coleshill, in Warwickshire, in 1747. He wrote, 1. Muscipula, a Latin poem of considerable merit. 2. Pharsalia and Philippi, or the two Philippi in Virgil's Georgics attempted to be explained and reconciled to History, 4to. 3. Remarks and Dissertations on Virgil; with some other classical observations published by Mr. Spence, 1768, 4to.

HOLDSWORTHY, a town in Devonshire, with a market on Saturdays. Lat. 50. 50 N. Lon. 2. 42 W.

HOLE. *s.* (*hol*, Dutch; hole, Saxon.) 1. A cavity narrow and long, either perpendicular or horizontal (*Bacon*). 2. A perforation; a small interstitial vacuity (*Boyle*). 3. A cave; a hollow place (*Shakspeare*). 4. A cell of an animal (*Addison*). 5. A mean habitation (*Dryden*). 6. Some subterfuge or shift (*Ains.*).

HOLERACEÆ, HOLORACEÆ, com-

monly written Oleraceæ (from olus, anciently holus, a pot-herb.) The name of the twelfth order in Linnéus's Natural Orders; and the fifty-third in his Fragments of a natural Method; containing Spinach, Beet, &c. &c.

HOLIBUT, or HOLLIBUT, in ichthyology. See PLEURONECTES.

HO'LIDAM. *s.* Blessed lady (*Hanmer*).

HO'LILY. *ad.* (from *holy.*) 1. Piously; with sanctity (*Shakspeare*). 2. Inviolably; without breach (*Sidney*).

HO'LINESS. *s.* (from *holy.*) 1. Sanctity: piety; religious goodness (*Rogers*). 2. The state of being hallowed; dedication to religion. 3. The title of the pope (*Addison*).

HOLINSHED (Raphael), an English historian famous for the Chronicles under his name, was descended from a family that lived at Bosely, in Cheshire; but neither the time of his birth, nor scarcely any circumstances of his life, are known. However, he appears to have been a man of considerable learning, and to have had a genius particularly adapted for history. His Chronicles of England, Scotland, and Ireland, were first published at London in 1570, in 2 vols. folio; and then in 1587, in 3 vols. In this second edition several sheets in the 2d and 3d vols. were castrated for containing some passages disagreeable to queen Elizabeth and her ministers; but the castrations have since been printed apart. Holinshed was not the sole compiler of this work, being assisted in it by several other hands. The time of his death is unknown; but from his will, which is prefixed to Hearne's edition of Camden's Annals, it appears to have happened between 1578 and 1582.

HO'LLA. *interj.* (*hola*, French.) A word used in calling to any one at a distance (*Milt.*).

To HO'LLA. *v. n.* (from the interjection.) It is now vitiously written *hollo*; sometimes *halloo.*) To cry out loudly (*Shakspeare*).

HOLLAND, a once celebrated republic of Europe, and principal of the Dutch states, or as they were commonly, though perhaps improperly, called, the Seven United Provinces. Holland is a peninsula, bounded on the north and west by the German Ocean, on the east by the Zuyder See and the state of Utrecht, and on the south by the river Meuse and Brabant. It is divided into North and South. North Holland includes all to the north of Amsterdam. South Holland extends from the state of Zealand and Brabant to the river Ye: the length of the whole, including the island of Texel and the islands in the Meuse, is about ninety miles; the breadth is various, from fifteen to forty-eight. It contains twenty-nine walled towns, with many others that enjoy municipal privileges, and above 400 villages. Six large cities have seats in the states general, viz. Dort, Haerlem, Delft, Leyden, Amsterdam, and Gouda. The number of inhabitants is estimated at 800,000. The soil of the country is so soft and marshy, that but for the constant care in forming ditches and canals, it would be hardly capable of cultivation; some part of it lies even lower than the sea, from which it is secured by dykes or dams. The meadow-grounds are rich, and great numbers of milch cows are kept by the farmers, and the making of butter and cheese is one of their principal occupations; these meadows are generally under water in the winter, and the water would continue there at all times, if the inhabitants of the country had not found means to discharge them, by mills invented for this purpose, into the ditches and canals. The Hollanders are affable, industrious, laborious, absorbed in trade, excellent sailors, good politicians, and lovers of liberty. A free exercise of religion is allowed to all persuasions except the Roman Catholics; but Calvinism is the most prevailing. This country was anciently inhabited by the Batavians, who derived their origin from the Catti, a people of Germany. Having been obliged to abandon their country on account of civil wars, they came to establish themselves in an island, formed by the waters of the Rhine and the Wahal or Leck, and named their country Batavia, or Betuwe, from Batton, the son of their king. These people served in the Roman armies in quality of auxiliary troops, and historians inform us, that some of them were at the battle of Pharsalia. They formed the ordinary guard of the emperor Augustus. The services which they rendered Germanicus, in Germany, were so important, that the senate gave them the appellation of brothers. They had afterwards a considerable share in the conquest of Britain, under Plancius and Agricola. They strengthened the party of Galba, and afterwards that of Vitellius, and it was principally to their valour that Julian the Apostate was indebted for the victory which he obtained over the Germans, near Strasburg. The name of Holland is by some said to be given it on account of the vast and thick forests of wood with which it was at one time covered. Holtlant, in German, signifying woodland; others are inclined to think that the Normans, who made a descent here about the year 836, gave the country this name, founding their opinion on the resemblance of names found in this country to those in Denmark and Norway, the ancient residence of the Normans, as Zealand, Oland, Schagen, Bergen, &c. On the decline of the Roman empire, the Batavians, or Hollanders, having thrown off their yoke, came under the dominion of the Saxons, and then of the French, under Childeric I. king of France. The Normans and the Danes were the next masters, from the time of Charlemagne, and ravaged the country three times with fire and sword: when they were driven away, Charles the Bald, emperor and king of France, erected Holland into a county, in the year 863, in favour of Thierry, duke of Aquitaine, who, five years after, was also made count of Zealand, by Louis, king of Germany. In the year 1299, the county of Holland devolved to the counts of Hainaut, and, in 1436, it fell to Philip the Good, duke of Burgundy, and afterwards to the emperor Maximilian; whose descendant, Philip II. king of Spain, was the last count of Holland; the seven provinces revolting from

him, and, after a long struggle, forming an independent republic. The states of the province have the title of the states of Holland and West Frieseland, and are formed of the nobility and towns. By West Friesland is to be understood North Holland, which is sometimes so called, and not the state or province of Friesland. The number of the nobility admitted into the assembly is not limited, and not always the same: they are elected by a majority of votes, and rarely exceed ten. The towns who have a right to send deputies were originally six; at present they are eighteen, of which seven are in North Holland, and eleven in South Holland. The number of deputies sent by each town is not fixed. In the year 1581, the Hague was appointed to be the place for the assembly of the states, when William of Nassau, prince of Orange, was acknowledged by the states-general of the United Province as the chief of their republic, and most certainly to him they were chiefly indebted for their establishment when they threw off their allegiance to Spain. He was assassinated at Delft, on the 10th of July, 1584. Maurice, of Nassau, succeeded his father, and, in consideration of his virtue and valour, was made governor, or stadtholder, of Holland, Zealand, and Utrecht. William Henry of Nassau, the grandson of Frederic Henry, brother of Maurice, obtained the three offices of stadtholder, captain, and admiral general, with a grant of the same to his descendants for ever. In the year 1677, this prince espoused Mary, daughter of James II. king of England, and, in 1689, was crowned king at Westminster. In the present disputes on the French revolution, Holland at first appeared hostile to the new republic, but never heartily to have co-operated with the allies. The stadtholder was most probably influenced by Prussia and England; but a party more powerful than his own were his enemies, and on the invasion of Holland by the French, in the beginning of the year 1795, the stadtholder, with his family, thought it prudent to take refuge in England. Such are the ways of Providence! in the year 1688, a prince of Orange came to England to obtain a crown, and in the year 1795, a prince of Orange fled hither for protection.

The preceding account of Holland we have given verbatim, from our most respectable Gazetteer (that by the rev. Clement Cruttwell), judging it improper, in the present unsettled state of continental affairs, to substitute any novel titles and description of this republic for the one that has been so long adopted by geographers. It is necessary for us, however, to add here, that since the invasion of the United Provinces by the French, in 1795, the Hollanders have, either in compliance with the wishes or commands of their new allies, not only new modelled their government and constitution, but first recurred to a name they had long rejected, the Dutch being for a time (about 1802) called Batavians, and Holland the Batavian republic, terms which about four years afterwards gave way to the kingdom of Holland.

By the treaty concluded at the Hague, in 1806, the kingdom of Holland was divided as follows:

Departments.	*Consisting of.*	*Chief Towns.*
1. Groninguen	The province of Groninguen, comprising Wied and West Woldingerland	Groninguen.
2. Friesland	The province of Friesland and Ameland	Leewarden.
3. Over-Issel	Over-Issel, and the country of Drenthe	Zwol.
4. Guelderland	Guelderland, Kuilemberg, and Buren	Arnheim.
5. Utrecht	Utrecht and Veanen	Utrecht.
6. Holland	Holland, Isselstein	The Hague.
7. Brabant	Dutch Brabant	Bois le Duc.
8. Zealand	Zealand	Middleburg.

It is also divided into four military divisions:

The first comprises the department of Holland, Brabant, and Utrecht: head quarters at the Hague.

The second, the province of Zealand: head quarters at Middleburg.

The third, the departments of Friesland and Groninguen: head quarters at Groninguen.

The fourth, the departments of Guelderland and Over-Issel: head quarters at Deventer.

Louis Napoleon, brother to the French emperor, was placed on the throne of Holland in 1806.

*Holland, a district of Lincolnshire in England, in the S.E. part of the county. It is divided into Upper and Lower, and lies contiguous to the shallow inlet of the sea called the Wash. In nature, as well as in appellation, it resembles the province of the same name in the Netherlands. It consists entirely of fens and marshes; some in a state of nature, but others cut by numberless drains and canals, and crossed by raised causeways. The lower or southern division is the most watery, and is preserved from constant inundations by nothing but vast banks, raised on the sea-coast and rivers. The air is unwholesome, and the water in general so brackish as to be unfit for internal purposes; on which account the inhabitants are obliged to make reservoirs of rain-water. In summer, vast swarms of insects fill the air, and prove a great nuisance. Yet even here industry has produced comfort and opulence, by forming excellent pasture land out of the swamps and bogs, and even making them capable of producing large crops of corn. The fens too, in their native state, are not without their utility; and afford various objects of curiosity to the naturalist. The reeds with which their waters are covered make the best thatch, and are annually harvested in great quantities for that purpose. Prodigious flocks of geese are bred among the undrained fens, forming a considerable object of commerce, as well for their quills and feathers, as for the bird itself, which is driven in great numbers to the Lon-

tion markets. The principal decoys in England for the various kinds of wild ducks, teal, widgeon, and other fowls of the duck kind, are in these parts. Wild geese, grebes, godwhits, whimbrels, coots, ruffs, and rees, and a great variety of other species of water-fowl, breed here in amazing numbers; and stares or starlings resort during winter, in myriads, to roost on the reeds, breaking them down by their weight. Near Spalding is the greatest heronry in England, where the herons build together on high trees, like rooks. The avoset, or yelper, is found in great numbers about Fossdike Wash, as also knots and dotterels.

HOLLAND (New), the largest island in the world, reaching from 10 to 44 deg. S. lat. and between 110 and 154 of long. east from London. It received its name from having been chiefly explored by Dutch navigators. The land first discovered in those parts was called Eendraght (Concord) Land, from the name of the ship on board which the discovery was made in 1616; 24 deg. and 25 deg. south. In 1618, another part of this coast, nearly in 15 deg. south, was discovered by Zeachen, who gave it the name of Arnheim and Diemen; though a different part from what afterwards received the name of Diemen's Land from Tasman, which is the southern extremity, in latitude 43 deg. In 1619, Jan Van Edels gave his name to a southern part of New Holland. Another part, situated between 30 and 33 deg. received the name of Leuwen. Peter Van Nuitz gave his name, in 1627, to a coast which communicates to Leuwen's Land towards the westward; and a part of the western coast, near the tropic of Capricorn, bore the name of De Wit. In 1628, Peter Carpenter, a Dutchman, discovered the great gulph of Carpentaria, between 10 and 20 deg. south. In 1687, Dampier, an Englishman, sailed from Timor, and coasted the western parts of New Holland. In 1699, he left England with a design to explore this country, as the Dutch suppressed whatever discoveries had been made by them. He sailed along the western coast of it, from 28 to 15 deg. He saw the land of Fendraght and of De Wit. He then returned to Timor; from whence he went out again, and examined the isles of Papua; coasted New Guinea; discovered the passage that bears his name; called a great island which forms this passage or strait on the east side, New Britain; and sailed back to Timor along New Guinea. This is the same Dampier who, between 1683 and 1691, sailed round the world by changing his ships. Notwithstanding the attempts of all these navigators, however, the eastern part of this vast tract was totally unknown till captain Cook made his voyages; and by fully exploring that part of the coast, gave his country an undoubted title to the possession of it; which accordingly has since been taken possession of under the name of New South Wales.

Some have disputed whether the title of island can be properly applied to a country of such vast extent, or whether it ought not rather to be denominated a continent; while others have replied, that though the word island, and others similar to it, do indeed signify a tract of land surrounded by sea, yet in the usual acceptation it means only a land of moderate extent surrounded in this manner. Were it otherwise, we might call the whole world an island, as it is every where surrounded by the sea; and in fact, Dionysius Perigetes applies this term to it, with the addition of the word immense, to distinguish it from other islands. The best rule, according to Mr. Stockdale, for determining when a country ought to lose the name of island and begin to be called a continent, is when it begins to lose the advantages of an insular situation. The first and principal of these, is the being capable of an union under one government, and thence deriving a security from all external attacks excepting those by sea; but in countries of great extent, this is not only difficult, but impossible. If we consider, therefore, New Holland as extending about a thousand miles every way, we shall find that its claim to be called a continent is undoubted; its length from east to west being about 2400 English miles, and 2300 from north to south.

This coast was first explored by capt. Cook, in the year 1770; but his stay was too short to examine the nature of the country with the accuracy which he would otherwise have done had he continued longer in it. In general, it was found rather barren than otherwise. Many brooks and springs were found along the eastern coost, but no river of any consequence. They found only two kinds of trees useful as timber, the pine, and another which produces a sort of gum. They found three kinds of palm-trees; but few esculent plants, though there are abundance of such as might gratify the curiosity of the botanist. A great variety of birds were met with, which have since been particularly described; but the number of quadrupeds bears but a very small proportion to that of the other animals.

This country has now become to us an object of more consequence than formerly, by reason of the establishment of a British colony in it; where the criminals condemned to be transported are sent to pass their time of servitude. On the 6th of December 1786, orders were issued by his Majesty in council for making a settlement in New Holland, establishing a court of judicature in the colony, and other necessary regulations. The whole received the complete sanction of parliament in the beginning of the year 1787. The squadron appointed for putting the design in execution consisted of the Sirius frigate, captain John Hunter; the Supply armed tender, lieut. H. L. Ball; three store ships, for carrying provisions and stores for two years; and lastly, six transports, to carry 778 convicts, of which 558 were males; with a detachment of marines in each, proportioned to the nature of the service. Governor Phillip hoisted his flag on board the Sirius, as commodore of the squadron, weighed anchor on the 15th of May; and they arrived at Botany Bay, on the 18th of January 1788.

The governor then took the necessary steps for the establishment of the colony. In 1801 there were 6500 persons under the governor's authority.

With regard to the state of this colony there have been various and discordant accounts. Some of these have represented the country in such a light, that it would seem impossible to subsist on it; and it has been said, that the people who have had the misfortune to go there already were in the utmost danger of starving before any assistance could be sent from Britain. These reports, however, appear not to be well founded. Difficulties must undoubtedly be felt at the first settlement of every uninhabited country; and we are not to expect that a colony, most of whom are wretches exiled for their crimes from their own country, can thrive in an extraordinary manner for some time. It appears, indeed, that so far from the transportation to this place having had any good effect in reforming them, the governor has been obliged to execute the utmost rigour of the law by hanging several of them. For our own parts, we expect that much good will result from the regulations lately recommended to our government by the Rev. Sam. Marsden, senior chaplain to the colony, regulations most of which have been adopted, and for the execution of which Mr. Marsden has just returned to New South Wales with ample powers. Scarcely any thing is too much to expect from the prudence, activity, intrepidity, and piety of this excellent man; and we doubt not that unborn ages will revere his name, and rejoice in the blessings he was the means of bringing to the colony.

The quadrupeds on the continent of New Holland hitherto discovered are principally of the Opossum kind, of which the most remarkable is the Kangaroo. There is also a species of dogs very different from those known in Europe. They are extremely fierce, and never can be brought to the same degree of familiarity with those we are acquainted with. Some of them have been brought to England, but still retain their usual ferocity. There are a great many beautiful birds of various kinds; among which the principal are the black swans already mentioned, and the ostrich or cassowary; which last arrives frequently at the height of seven feet or more. Several kinds of serpents, large spiders, and scopolendras, have also been met with. There are likewise many curious fishes; though the finny tribe seem not to be so plentiful on the coast as to give any considerable assistance in the way of provisions for the colony. Some very large sharks have been seen in Port Jackson, and two smaller species, one named the Port Jackson shark, the other Watts's shark. The latter, notwithstanding its diminutive size, the mouth scarce exceeding an inch in breadth, is excessively voracious. One of them having been taken and flung down upon the deck, lay there quiet for two hours; after which Mr. Watts's dog happening to pass by, the fish sprung upon it with all the ferocity imaginable, and seized it by the leg in such a manner that the animal could not disengage himself without assistance.

The climate of this continent appears not to be disagreeable, notwithstanding the violent complaints which some have made about it. The heat has never been excessive in summer, nor is the cold intolerable in winter. Storms of thunder and lightning are frequent: but these are common to all warm countries; and it has been supposed (though upon what foundation does not well appear) that were the country cleared of wood, and inhabited, these would in a great measure cease. A shock of an earthquake has likewise been felt; but these natural calamities are incident to some of the finest countries in the world. It is not known whether there are any volcanoes or not.

The inhabitants of New Holland are by all accounts represented as the most miserable and savage race of mortals, perhaps, existing on the face of the earth. They go entirely naked; and though pleased at first with some ornaments which were given them, they soon threw them away as useless. It does not appear, however, that they are insensible of the benefits of clothing, or of some of the conveniences which their new neighbours are in possession of. Some of them, whom the colonists partly clothed, seemed to be pleased with the comfortable warmth they derived from it; and they all express a great desire for the iron tools which they see their neighbours make use of. Their colour, in the opinion of captain Cook, is rather a deep chocolate than a full black; but the filth with which their skins are covered prevents the true colour of them from appearing. At some of their interviews with the colonists, several droll instances happened of their mistaking the negroes among the colonists for their own countrymen. Notwithstanding their disregard for European finery, they are fond of adorning, or rather deforming, their bodies with scars; so that some of them cut the most hideous figure that can be imagined. The scars themselves have an uncommon appearance. Sometimes the flesh is raised several inches from the skin, and appears as if filled with wind; and all these seem to be reckoned marks of honour among them. Some of them perforate the cartilage of the nose and thrust a large bone through it, an hideous kind of ornament humorously called by the sailors their *sprit-sail yard*. Their hair is generally so much clotted with the red gum already mentioned, that they resemble a mop. Though these savages allow their beards to grow to a considerable length, it does not appear that they look upon them to be any ornament, but rather the contrary, as appears from the following instance. Some young gentlemen belonging to the Sirius, one day met an old man in the woods with a beard of considerable length. This his new acquaintance let him know that they would rid him of, stroking their chins, and showing him the smoothness of them at the same time. At length the old fellow consented; and one of the youngsters taking a pen-

knife from his pocket, and making the best substitute for lather he could, performed the operation with such success that the Indian seemed highly delighted. In a few days he paddled alongside of the Sirius again, pointing to his beard; but could not by any means be prevailed upon to enter the ship. On this a barber was sent down to him, who again freed him from his beard, at which he expressed the utmost satisfaction. It has, however, been found impossible to form any kind of permanent intercourse with the natives, though many attempts have been made for that purpose; but in his letter above quoted, governor Phillip declares that he has not the least apprehension of their doing any damage to the colony. At first the colonists imagined the spears of the New Hollanders to be very trivial weapons; but it now appears that they are capable of inflicting very grievous and mortal wounds. They are sometimes pointed with a sharp piece of the same reed of which the shafts are made, but more frequently with the sharp bone of the sting-ray. They certainly burn their dead; which perhaps has given rise to the report of their being cannibals. Governor Phillip, observing the ground to be raised in several places, caused one of these tumuli to be opened, in which were found a jaw-bone half consumed and some ashes. From the manner in which the ashes are deposited, it appears that the body has been laid at length, raised from the ground a little space, and consumed in that posture; being afterwards lightly covered with mould.

The only domestic animals they have are the dogs already mentioned, which resemble the fox-dog of England. In their language these animals are called *dingo*; but all other quadrupeds without exception they name *kangaroo*.—They seem very little given to thieving in comparison with the inhabitants of most of the South Sea islands; and are very honest among themselves, leaving their spears and other implements open on the beach, in full and perfect security of their remaining untouched. They are very expert at throwing their javelins, and will hit a mark with great certainty at a considerable distance; and it seems that sometimes they kill the kangaroo with this weapon, as a long splinter of one of the spears was taken out of the thigh of one of these animals, the flesh having closed over it completely. The people are more numerous than was at first imagined, though still the number of inhabitants must be accounted few in comparison to the extent of country; and there is great reason to believe that the interior parts are uninhabited.

The New Hollanders bake their provisions by the help of hot stones, like the inhabitants of the South Sea islands. They produce fire with great facility according to captain Cook, but with difficulty according to later accounts, and spread it in a wonderful manner. To produce it, they take two pieces of dry soft wood; one is a stick about eight or nine inches long, the other piece is flat. The stick they shape into an obtuse point at one end; and pressing it upon the other, turn it nimbly, by holding it between both their hands, as we do a chocolate-mill; often shifting their hands up, and then moving them down upon it, to increase the pressure as much as possible. By this method they get fire in less than two minutes, and from the smallest spark they increase it with great speed and dexterity. "We have often seen (says captain Cook), one of them run along the shore, to all appearance with nothing in his hand, who stooping down for a moment, at the distance of every fifty or an hundred yards left fire behind him, as we could see, first by the smoke, and then by the flame along the drift of wood and other litter which was scattered along the place. We had the curiosity to examine one of these planters of fire when he set off, and we saw him wrap up a small spark in dry grass, which when he had run a little way, having been fanned by the air that his motion produced, began to blaze; he then laid it down in a place convenient for his purpose, inclosing a spark of it in another quantity of grass, and so continued his course."

For more on the subject of this article, we must refer to the interesting works of Savage, Peron, &c.

HOLLAND, in commerce, a fine and close kind of linen, so called from its being first manufactured in Holland.

HOLLAR (Wenceslaus), a celebrated engraver, was born at Prague in Bohemia in 1607. His family having been ruined in the destruction which had fallen upon their country by the wars, he was obliged to go abroad to seek for bread. By close application to drawing he acquired great excellence in delineating views, which procured him reputation and profit. The earl of Arundel being on an embassy to the imperial court, was so pleased with his taste that he took him into his suite, and brought him to England. His first performance was a view of and from the town of Greenwich, in two plates, in 1637. After this he etched a great number of views and portraits. In 1640 appeared his fine set of figures in 28 plates, called Ornatus Muliebris Anglicanus, containing the dresses of Englishwomen of all degrees. In 1645 he went to the continent and settled at Antwerp, where also the earl of Arundel resided with his family. While there he etched a great number of portraits and landscapes after Breughel, Elsheimer, and Teniers. In 1652 he returned to England, and continued there laboriously employed till 1677, when he died. His works are exceedingly numerous, and generally possess great spirit, freedom, and lightness, with a very high finishing.

HO'LLOW. *a.* (from *hole.*) 1. Excavated; having a void space within; not solid (*Dry.*). 2. Noisy, like sound reverberated from a cavity (*Dryden*). 3. Not faithful; not sound; not what one appears (*Milton*).

HO'LLOW. *s.* 1. Cavity; concavity (*Bacon*). 2. Cavern; den; hole (*Prior*). 3. Pit (*Addison*). 4. Any opening or vacuity (*Genesis*). 5. Passage; canal (*Addison*).

To Ho'llow. *v. a.* (from the noun.) To make hollow; to excavate (*Spectator*).

To Ho'llow. *v. n.* To holla; to shout; to hoot (*Dryden*).

Hollow square, in military language, is a body of foot, drawn up with an empty space in the middle, for the colours, drums, and baggage; facing and covered by the pikes every way, to oppose the horse.

Ho'llow-hearted. *a.* (*hollow* and *heart.*) Dishonest; insincere (*Hudibras*).

HO'LLOWLY. *ad.* (from *hollow.*) 1. With cavities. 2. Unfaithfully; insincerely; dishonestly (*Shakspeare*).

HO'LLOWNESS. *s.* (from *hollow.*) 1. Cavity; state of being hollow (*Hakewill*). 2. Deceit; insincerity; treachery (*South*).

HOLLOW ROOT, in botany. See Adosa.

HOLLY, in botany. See Ilex.

Holly knee, in botany. See Ruscus.

Holly sea, in botany. See Eryngium.

Hollyhock, in botany. See Alceum.

HOLM, a town in Cumberland, with a market on Saturdays. It is sometimes called Abbey-Holm from an abbey which formerly stood here. Lat. 54. 53 N. Lon. 3. 19 W.

Holm-oak. See Quercus.

Holm sea. See Eryngium.

HOLME. *s.* *Holme* or *howme,* whether jointly or singly, comes from the Saxon holme, a river island; or if the place be not such, the same word signifies also a hill, or mountain, (*Gibson*).

HOLMESDALE, a rough and woody tract in Surry, lying immediately beneath the hills to the S. and E. of that county, and extending into Kent.

HOLMS-KIO'LDIA. In botany, a genus of the class didynamia, order angiospermia. Calyx five-toothed, dilated, very much spread: corol ringent; capsule one-celled (as commonly supposed, but not fully decided); manyseeded. One species; a Bengal shrub with square branches; leaves opposite, ovate, or heartshaped; calyx of corol red.

HOLOCAUST, formed from ὁλος, whole, and καιω, I consume with fire, a kind of sacrifice, wherein the whole offering is burnt or consumed by fire, as an acknowledgment that God, the creator, preserver, and lord of all, was worthy of all honour and worship, and as a token of men's giving themselves entirely up to him. It is called also in Scripture a burnt-offering. Sacrifices of this sort are often mentioned by the heathens as well as Jews; particularly by Xenophon, Cyropæd. lib. viii. p. 464. ed. Hutchins. 1738, who speaks of sacrificing holocausts of oxen to Jupiter, and of horses to the sun: and they appear to have been in use long before the institution of the other Jewish sacrifices by the law of Moses; (see Job. i. 5. xlii. 8. and Gen. xxii. 13. viii. 20.) On this account, the Jews, who would not allow the Gentiles to offer on their altar any other sacrifices peculiarly enjoined by the law of Moses, admitted them by the Jewish priests to offer holocausts; because these were a sort of sacrifices prior to the law, and common to all nations. During their subjection to the Romans, it was no uncommon thing for those Gentiles to offer sacrifices to the God of Israel at Jerusalem. Holocausts were deemed by the Jews the most excellent of all their crifices.

HOLOGRAPHUM, composed of ὁλος, all, and γραφω, I write, in the civil law, something written wholly in the hand-writing of the person who signs it. The word is chiefly used in speaking of a testament written wholly in the testator's own hand. The Romans did not approve of holographic testaments; and though Valentinian authorised them by a novel, they are not used where the civil law is in full force.

HOLOSTEUM. Chickweed. In botany, a genus of the class triandria, order trigynia. Calyx five-leaved, petals five; capsule one celled, nearly cylindrical, bursting at the top. Five species; natives of the West Indies or America, except one, H. umbellatum, so called from its flowers in umbels, and which is found wild on the walls of our own country.

HOLO'STEUS. See Osteocolla.

HOLOTHURIA. In zoology, a genus of the class vermes. Body detached, cylindrical, thick, naked, and open at the extremity; mouth surrounded by fleshy branched tentacles. Twenty-three species: inhabitants chiefly of the north seas; some of them of the Mediterranean and Indian seas; some of the Atlantic. The following are some of the chief. See Nat. Hist. Pl. CXVIII.

1. H. elegans, with twenty branched tentacles; body papillous, varied with red and white; papillæ, painted distant, those of the back disposed in six rows. Inhabits the northern seas, and squirts out water like a syphon from the lower orifice: from eight to eleven inches long.

2. H. tremula. Upper surface covered with numerous conic papillæ, lower with cylindric ones; tentacles fascinulate: body generally a beautiful mixture of red and white: but varying in colour: the cylindric tubes beneath the body act as so many suckers, by which the animal fixes itself to the bottom of the sea. Inhabits the Mediterranean and Adriatic seas: a foot long.

3. H. physalis, with differently shaped, filiform, pendulous cirri: body ovate by a line, and somewhat triangular. Inhabits the Atlantic, and appears like a transparent bladder.

4. H. lævis. Elongated with white tentacles; body with five rows of lines and dots, soft, smooth, whitish, pellucid: from one to six inches long. Inhabits Greenland seas among rocks; hides itself frequently in the clay, protruding every alternate tentacle, and contracting the rest.

5. H. impaticus. Body rigid cinereous; tentacles twenty, filiform, seven-cleft and denticulate at the tip. Inhabits the shores of the Red sea, under stones, or in the pores of the Spongia officinalis. The whole tribe are marine inhabitants, and expand or contract themselves at pleasure: the anterior aperture serves

them both as a mouth and vent, and from the hinder one they reject waters which have been previously sucked in: the tentacles are universally retractile.

HOLP. The old pret. and part. pass of *help*.

HO'LPEN. The old participle passive of *help*.

HOLSTEBROE, a town of Denmark, in N. Jutland, situate on a shallow river which runs into the North Sea. Lat. 56. 20 N. Lon. 9. 25 E.

HOLSTEIN (Duchy of), a country of Germany, in the circle of Lower Saxony. Including the lordship of Pinneberg, it is bounded on the north by the duchy of Sleswick and the Baltic, on the east by the Baltic, on the south by the duchy of Lauenberg, the territories of Lubeck, and Hamburg and the Elbe, and on the west by the Elbe and the German Sea; about seventy miles in length from east to west, and forty-eight in breadth from north to south. Its situation between the Baltic and the German Ocean exposes it to frequent storms, which occasions heavy expence to the land-owners, in raising dykes to prevent inundations, especially in the districts bordering on the German Sea and the Elbe. These districts consist of excellent marsh land, producing wheat, barley, oats, beans, peas, and rape-seed, in great plenty. The meadows and pastures feed great numbers of cattle, both milch kine and to be fatted for the butcher. The other parts of the country are still more fertile. Holstein is divided into four provinces, namely, Holstein Proper, Stormar, Ditmarsen, and Wagria. The three first of these were formerly called Nordalbingia, or Saxony beyond the Elbe. The Saxons of this country were a free people, till they were subdued by Charlemagne, who transported 10,000 families into Brabant, Flanders, and Holland. A treaty was made between this prince and the king of Denmark, which fixed the river Eider as the common boundary of their two empires. The country on the south of the river was called the Marche, and a marggrave appointed to defend it. Lothario, duke of Saxony, who afterwards became emperor, erected Holstein Proper and Stormar into a county, in favour of the count of Scauenburg, in the year 1106; whose son, Adolphus II, incorporated Wagria with Holstein, and peopled his estates with strangers from Holland and Westphalia. The territories were afterwards divided into separate principalities. One of the princes who reigned here obtained from the king of Denmark the investiture of Sleswick. This branch became extinct, and the people elected Christian I, king of Denmark, who became duke of Sleswick, and count of Holstein; which was soon after erected into a duchy. His posterity reigned here in the same manner as over Denmark. The branch of Holstein Gottorpf, founded by the second son of king Frederick I, was often disturbed by that which reigned in Denmark, and in the year 1720, the reigning prince was entirely dispossessed of his dominions. This prince had espoused Ann, the eldest daughter of Peter I, emperor of Russia. In the year 1743, his son Charles Ulrick was by his mother's sister, Elizabeth, empress of Russia, declared grand duke of Russia, and took the name of Peter Feodorowitz. The king of Denmark, as duke of Holstein Gluckstadt, has a seat and voice in the diet of the empire in the college of princes, so also has the emporor, or empress of Russia, for Holstein Gottorpf. The assessment of the whole duchy, in the matricula of the empire, is 800 florins. Holstein Gluckstadt pays to the imperial chamber 189 rix dollars thirty-one kruitzers, and Holstein Gottorpf the same. The king of Denmark appoints a governor over his part of Holstein, who generally resides at Gluckstadt. The regency court for Russian Holstein is held at Kiel. The principal trading towns are Altona, Gluckstadt, and Kiel. The exports of Holstein are wheat, barley, malt, starch, buck-wheat, peas, beans, rapeseed, horned cattle, sheep, rams, swine, horses, poultry, butter, cheese, venison, and fish.

HOLSTON, a river of United America, in the Tennasee government, which joins the Tennasee, twenty miles W. Knoxville.

HOLSTER. *s.* (heolyteꝛ, Saxon.) A case for a horseman's pistol (*Butler*).

HOLT, (Sax.) a wood; wherefore the names of towns beginning or ending with holt, as Buck-holt, &c. denote that formerly there was great plenty of wood in those places.

Holt, a town of England, in the county of Norfolk, with a weekly market on Saturday: twenty-two miles N. W. of Norwich, and 122 N. N. E. of London.

Holt, a town of Norway, in the diocese of Christiansand: thirty-two miles N. N. E. of Christiansand.

Holt, a town of North Wales, in the county of Denbigh: three miles N. E. of Wrexham.

Holt, a town of Germany, in the circle of Westphalia, and duchy of Cleves: twenty-seven miles S. E. of Cleves. Lon. 24. 12 E. Ferro. Lat. 51. 39 N.

Holt (Sir John), knight, eldest son of sir Thomas Holt, serjeant at law, was born in 1642. He entered himself of Gray's Inn in 1658; and applied to the common law with so much industry, that he soon became a very eminent barrister. In the reign of James II. he was made recorder of London, which office he discharged with much applause for about a year and a half; but lost his place for refusing to expound the law suitably to the king's designs. On the arrival of the prince of Orange, he was chosen a member of the convention parliament, which afforded him a good opportunity of displaying his abilities; so that, as soon as the government was settled, he was made lord chief justice of the court of king's bench, and a privy counsellor. He continued chief justice for 22 years, with great repute for steadiness, integrity, and thorough knowledge in his profession. Upon great occasions he asserted the law with intrepidity, though he thereby ventured to incur by turns the indig-

nation of both houses of Parliament He published some Reports, and died in 1709.

HO'LY. *a.* (haliȝ, Saxon.) 1. Good; pious; religious (*Shakspeare*). 2. Hallowed; consecrated to divine use (*Dryden*). 3. Pure; immaculate (*South*). 4. Sacred (*Shakspeare*).

HOLY-GHOST. *s.* The third person of the adorable Trinity. See TRINITY.

HOLYHEAD, a town and cape of the isle of Anglesea in Wales, and in the Irish channel, where people usually embark for Dublin, there being regular packet-boats that sail for that city every Monday, Wednesday, and Friday, wind and weather permitting. It is 276 miles from London, and has a very convenient harbour for the northern trade, when taken short by contrary winds. It is situated near the extremity of the Isle, and is joined to the north-west part of it by a stone bridge of one arch. It has a small market on Saturdays. The parish is about five or six miles long, and two or three broad, bounded nearly by the sea. The church stands above the harbour, within an old quadrangular fortification, with a bastion at each corner, built about 450. On a mountain near it is another old fortification called Turris Munimentum, which is an old stone wall without mortar; and in its centre is a small turret, that contains a well of water. Holyhead was formerly used to be visited by Irish rovers, and was defended as a place of consequence. There are several remains of old fortifications and Druidical antiquities in its neighbourhood, as well as chapels of religious worship. Here also a lighthouse has been recently erected. Lat. 53. 19 N. Lon. 4. 24 W.

HOLY-ISLAND, a small island lying on the coast of England, ten miles south-east of Berwick, in Northumberland. Bede calls it a semi-island, being, as he observes, twice an island and twice continent in one day: for at the flowing of the tide, it is encompassed by water; and at the ebb, there is an almost dry passage, both for horses and carriages, to and from the main land; from which, if measured on a straight line, it is distant about two miles eastward; but, on account of some quicksands, passengers are obliged to make so many detours that the length of way is nearly doubled. The water over these flats at spring-tides is only seven feet deep. This island was by the Britons called Inis Medicante; also Lindisfarne, from the small rivulet of Lindi or Landi, which here runs into the sea, and the Celtic word *fahren*, or "recess;" and on account of its being the habitation of some of the first monks in this country, it afterwards obtained its present name of Holy-Island. It measures from east to west about two miles and a quarter, and its breadth from north to south is scarcely a mile and a half. At the north-west part there runs out a spit of land of about a mile in length. The monastery is situated at the southernmost extremity; and at a small distance north of it stands the villlage. On this island there is plenty of fish and fowl: but the air and soil are bad. There is not a tree on the island. The village, which stands on a rising ground, consists but of a few scattered houses, chiefly inhabited by fishermen; and it has two inns. The north and east coasts are formed of perpendicular rocks, the other sides sink by gradual slopes to the sands. There is a commodious harbour, defended by a block-house; which last was surprised and taken in 1715, but was soon invested and retaken. Holy-island, though really part of Northumberland, belongs to Durham; and all civil disputes must be determined by the justices of that county. It was a very ancient episcopal seat. Ardan the first bishop, after presiding in it fourteen years, died and was buried here A. D. 651.

HOLY-ROOD DAY, a festival observed by the Roman catholics, in memory of the exaltation of our Saviour's cross.

HOLY THURSDAY, or ASCENSION DAY, the fortieth day from Easter; being the day on which our Saviour's ascension is celebrated.

HOLY WEEK. The week before Easter.

HOLYWELL, a town of North Wales, in the county of Flint, chiefly celebrated for a spring, called St. Winnifred's Well, from whence it takes its name, and concerning which many fables have been told. It issues from the foot of a hill with great impetuosity, and turns several mills erected for working copper, making brass-wire, paper, and snuff, and winding cotton, &c. At the back of the town is a hill, in which lead ore is found. Holywell has a weekly market on Friday: fifty-two miles N.NW. Shrewsbury, and 212 N.W. London. Lat. 54. 13 N. Lon. 3. 21 W. This town contains 1146 houses, and 5567 inhabitants.

HOLYWELL WATER. A mineral water, arranged under the class of simple cold waters. It possesses similar virtues to that of Malvern. See MALVERN WATER.

HO'LYDAY. *s.* (*holy* and *day*.) 1. The day of some ecclesiastical festival. 2. Anniversary feast (*Waller*). 3. A day of gayety and joy (*Shakspeare*). 4. A time that comes seldom (*Dryden*).

HOLYWOOD (John), or Halifax, or Sacrobosco, an English mathematician, was born at Halifax in Yorkshire, though both the Irish and Scotch have claimed him as their countryman. After receiving his education at Oxford he entered into orders and went to Paris, where he died in 1256. He wrote; 1. De Sphæra Mundi; 2. De Anni Ratione: 3. De Algorismo.

HOLZAPFEL, a town of Westphalia, capital of a county of the same name, which gives a seat in the diets. It is situate on the Lahn at the foot of a mountain. Lat. 50. 22 N. Lon. 7. 44 E.

HOLZOPAL, or WOOD-OPAL. See OPAL.

HO'MAGE, *s.* (*hommage*, French; *homagium*, low Latin.) 1. Service paid and fealty professed to a sovereign or superior lord (*Davies*). 2. Obeisance; respect paid by external action (*Denham*).

To HO'MAGE. *v. a.* (from the noun.) To reverence by external action; to pay honour to; to profess fealty.

HO'MAGER. *s.* (*hommager*, Fr.) One who holds by homage of a superiour lord (*Bacon*).

HOMA'LIUM. In botany, a genus of the class polyandria, trigynia. Calyx six or seven parted; petals six or seven; stamens eighteen or twenty-one, three before each petal; capsule one-celled, many seeded. Two species: a West India tree, resembling the elm, and a shrub of Guiana.

HOMBERG (William), a famous chemist, was born in 1652 at Batavia, where his father was governor of the arsenal. He at first entered into the army, but at length quitted that profession for the law, which he also abandoned and betook himself to the sciences, particularly botany, medicine, and chemistry; to improve himself in which he travelled into various countries. In 1682 he fixed his residence in France, and abjured the protestant religion; but being disappointed in his views of patronage, he went to Rome and practised physic. Afterwards he returned to Paris, where he became a member of the academy of sciences, and chemist to the duke of Orleans, who also appointed him his first physician. He died in 1715. Chemistry is greatly indebted to his labours, particularly for the discovery of the properties of the Bologna stone, and its phosphoric appearance after calcination. He never published any distinct work, but some of his papers are in the memoirs of the academy.

HOMBERG'S SEDATIVE SALT. See BORACIC ACID.

HOMBERG'S PYROPHORUS. See PYROPHORUS.

HOMBURG, a town of Germany, in the landgravate of Hesse Cassel. Lat. 50. 45 N. Lon. 9. 26 E.

HOMBURG, a town of Germany, in the duchy of Deux Ponts. Lat. 49. 16 N. Lon. 7. 32 E.

HOME. *s.* (ham, Saxon.) 1. His own house; the private dwelling (*Dr.*). 2. His own country (*Shakspeare*). 3. The place of constant residence (*Prior*). 4. United to a substantive, it signifies domestick, or of the same country (*Bacon*).

HOME. *ad.* (from the noun.) 1. To one's own habitation (*Locke*). 2. To one's own country. 3. Close to one's own breast or affairs (*Addison*). 4. To the point designed; closely (*Sanderson*). 5. United to a substantive, it implies force and efficacy (*Stillingfleet*).

HOME (Henry), lord Kames, a learned Scotch judge and elegant writer, was born in 1696, and became by his merit the senior lord of Session in Scotland. He wrote. 1. Essays upon several Subjects concerning British Antiquities, 1746; 2. Essays on the Principles of Morality and Natural Religion, 8vo.; 3. Historical Law, 8vo.; 4. The Principles of Equity, folio; 5. Elements of Criticism, three vols. 8vo. a work which has experienced universal approbation; 6. The Gentleman Farmer, 8vo. 7. Loose Hints upon Education, 8vo.; 8. The History of Man, four vols. 8vo. He died in 1782.

HO'MEBORN. *a.* (*home* and *born.*) 1. Native; natural (*Donne*). 2. Domestick; not foreign (*Pope*).

HO'MEBRED. *a.* (*home* and *bred.*) 1. Native; natural (*Hammond*). 2. Not polished by travel; plain; rude; artless; uncultivated (*Dryden*). 3. Domestick; not foreign (*Spenser*).

HO'MEFELT. *a.* (*home* and *felt.*) Inward; private (*Pope*).

HO'MELINESS. *s.* (from *homely.*) Plainness; rudeness; coarseness (*Addison*).

HO'MELY. *a.* (from *home.*) Plain; homespun; not elegant; not beautiful; not fine; coarse; rude (*South*).

HO'MELY. *ad.* Plainly; coarsely; rudely (*Dryden*).

HO'MELYN. *s.* A kind of fish (*Ainsworth*).

HO'MEMADE. *a.* (*home* and *made.*) Made at home (*Locke*).

HO'MER. *s.* A Hebrew measure of about three pints (*Leviticus*).

HOMER, a celebrated Greek poet, the most ancient of all the profane writers. The age in which he lived is not known, though some suppose it to be about 168 years after the Trojan war, or, according to others, 160 years before the foundation of Rome. According to Paterculus, he flourished 968 years before the Christian era, or 884, according to Herodotus, who supposes him to be cotemporary with Hesiod. The Arundelian Marbles fix his era 907 years before Christ, and make him also cotemporary with Hesiod. The place of his birth is also unknown, and no less than seven illustrious cities laid claim to it, Smyrna, Chios, Colophon, Salamis, Rhodos, Argos, Athenæ, but the place of nativity, parentage, and connexions of this extraordinary man, whom some have represented blind, have never been properly ascertained. In his two celebrated poems called the Iliad and Odyssey, Homer has displayed the most consummate knowledge of human nature, and rendered himself immortal by the sublimity, the fire, sweetness, and elegance of his poetry. In his Iliad, Homer has described the resentment of Achilles, and its fatal consequences in the Grecian army before the walls of Troy. In the Odyssey, the poet has for his subject the return of Ulysses into his country, with the many misfortunes which attended his voyage after the fall of Troy. Though the Iliad claims an uncontested superiority over the Odyssey, yet the same sublimity and elegance prevail, though divested of its more powerful fire; and Longinus, the most refined of critics, compares the Iliad to the mid-day, and the Odyssey to the setting sun, and observes, that the latter still preserves its original splendor and majesty, though deprived of its meridian heat. Nothing was ever comparable to the clearness and majesty of Homer's style; to

the sublimity of his thoughts; to the strength and sweetness of his verses. All his images are striking; his descriptions just and exact, the passions so well expressed, and nature so just and finely painted, that he gives to every thing motion, life, and action. But he more particularly excels in invention, and in the different characters of his heroes, which are so varied, that they affect us in an inexpressible manner. In a word, the more he is read by a person of good taste, the more he is admired. Nor are his works to be esteemed merely as entertaining poems, or as the monuments of a sublime and varied genius. He was in general so accurate with respect to costume, that he seldom mentioned persons or things that we may not conclude to have been known during the times of which he writes; and it was Mr. Pope's opinion, that his account of people, princes, and countries, was purely historical, founded on the real transactions of those times, and by far the most valuable piece of history and geography left us concerning the state of Greece in that early period. His geographical divisions of that country were thought so exact, that we are told of many controversies concerning the boundaries of Grecian cities which have been decided upon the authority of his poems. The ancients had such veneration for Homer, that they not only raised temples and altars to him, but offered sacrifices, and worshipped him as a god. Alcibiades gave a rhetorician a box on the ear for not having Homer's writings in his school. Alexander was ravished with them, and commonly placed them under his pillow with his sword: he inclosed the Iliad in the precious casket that belonged to Darius; "in order (said he to his courtiers) that the most perfect production of the human mind might be inclosed in the most valuable casket in the world." And one day seeing the tomb of Achilles in Sigæa, "Fortunate hero! (cried he), thou hast had a Homer to sing thy victories!" Lycurgus, Solon, and the kings and princes of Greece, set such a value on Homer's works, that they took the utmost pains in procuring correct editions of them, the most esteemed of which is that of Aristarchus. Didymus was the first who wrote notes on Homer; and Eustathius, archbishop of Thessalonica, in the twelfth century, is the most celebrated of his commentators. Mr. Pope has given an elegant translation of the Iliad, adorned with the harmony of poetic numbers; Madame Dacier has translated both the Iliad and Odyssey in prose; and Mr. Cowper, in blank-verse. Besides the Iliad and Odyssey, Homer wrote, according to the opinion of some authors, a poem upon Amphiaraus's expedition against Thebes, besides the Phoceis, the Cercopes, the small Iliad, the Epicichlides, and the Batrachomyomachia, and many hymns to some of the gods. Those who desire to know the several editions of Homer, and the writers who have employed themselves on the works of that great poet, may consult Fabricius, in the first volume of his Bibliotheca Græca, Dibdin's *Introduction to the Classics*, or Dr. A. Clarke's Bibliographical Dictionary.

Lord Kames, in his "Sketches of the History of Man," speaks of Homer in the following terms:—"Homer is undoubtedly a wonderful genius, perhaps the greatest that ever existed: his fire, and the boldness of his conceptions, are inimitable. But in that early age, it would fall little short of a real miracle, to find such ripeness of judgment, and correctness of execution, as in modern writers are the fruits of long experience, and progressive improvements, during the course of many centuries. Homer is far from being so ripe or so correct. I shall mention but two or three particulars. The first is, that he reduces his heroes to little better than puppets. Not one of them performs an action of eclat, but with the assistance of some deity; even Achilles himself is every where aided by superior powers. It is Jupiter who inspires Hector with boldness to perform the illustrious actions that are so finely described in the fifteenth book; and it is Jupiter, who, changing sides, fills his heart with dismay. Glaucus, desperately wounded, supplicates Apollo, is miraculously healed, and returns to the battle perfectly sound. Hector, struck to the ground with a stone, and at the point of giving up the ghost, is cured by Apollo, and sent back to the battle with redoubled vigour. Can Homer's admirers be so blind as not to perceive, that this sort of machinery detracts from the dignity of his heroes, renders them less interesting, and less worthy of admiration? Homer, however, is deservedly such a favourite, that we are prone to admit any excuse. In days of ignorance, people are much addicted to the marvellous. Homer himself, it may be justly supposed, was infected with that weakness; and he certainly knew that his hearers would be enchanted with every thing wonderful and out of the common course of nature. Another particular is, his digressions without end, which draw our attention from the principal subject. I wish as good an apology could be made for them. Diomedes (Book VI.) for instance, meeting with Glaucus in the field of battle, and doubting from his majestic air whether he might not be an immortal, enquires who he was, declaring that he would not fight with a god. Glaucus lays hold of this very slight opportunity, in the very heat of action, to give a long history of his family. In the mean time, the reader's patience is put to a trial, and his ardour cools. Agamemnon (Book XIV.) desiring advice how to resist the Trojans, Diomedes springs forward; but before he offers advice, gives the history of all his progenitors, and of their characters, in a long train. And after all, what was the sage advice that required such a preface? It was, that Agamemnon should exhort the Greeks to fight bravely. At any rate, was Diomedes so little known, as to make it proper to suspend the action at so critical a juncture for a genea-

logical history? There is a third particular which justly merits censure; and that is, an endless number of minute circumstances, especially in the description of battles, where they are most improper. One capital beauty of an epic poem is, the selection of such incidents and circumstances as make a deep impression, keeping out of view every thing low or familiar. An account of a single battle employs the whole fifth book of the Iliad, and a great part of the sixth: yet in the whole there is no general action; but unknown warriors, whom we never heard of before, killed at a distance with an arrow or a javelin; and every wound described with anatomical accuracy. The whole seventeenth book is employed in the contest about the dead body of Patroclus, stuffed with minute circumstances, below the dignity of an epic poem. In such scenes the reader is fatigued with endless particulars; and has nothing to support him but the melody of Homer's versification. Gratitude would prompt one to apologise for an author who affords so much pleasure: the only apology I can think of for the particular last mentioned is, that Homer had no good models to copy after; and that without good models it is in vain to expect maturity of judgment. In a word, Homer was a blazing star, and the more to be admired, because he blazed in an obscure age. But that he should in no degree be tainted with the imperfections of such an age is a wild thought."

HO'MESPUN. *a.* (*home* and *spun.*) 1. Spun or wrought at home; not made by regular manufacturers (*Swift*). 2. Not made in foreign countries (*Addison*). 3. Plain; coarse; rude; homely; inelegant (*Sandys*).

Ho'mespun. *s.* A coarse, inelegant, rude, rustick man: not in use (*Shakspeare*).

HO'MESTALL. Ho'mestead. *s.* (ham and ꞅꞇeꝺe, Saxon.) The place of the house (*Dryden*).

HO'MEWARD. Ho'mewards. *ad.* (ham and peaꞃꝺ, Saxon.) Toward home; toward the native place (*Sidney*).

HO'MICIDE. *s.* (*homicidium*, Latin.) 1. Murder; manquelling (*Hooker*). 2. Destruction (*Dryden*). 3. (*homicida*, Latin.) A murderer; a manslayer (*Shakspeare*).

Homicide, in law, is the killing of a man by a man. Of this there are several species, as homicide by self-defence, homicide by misadventure, justifiable homicide, manslaughter, chance-medley, and murder. Homicide by self-defence, *se defendendo*, or in a man's own defence, is where one has no other possible means of preserving his life from one who combats with him on a sudden quarrel, and kills the person by whom he is reduced to such inevitable necessity. And not only he who on an assault retreats to a wall, or some such strait, beyond which he can go no farther, before he kills the other, is judged by the law to act upon unavoidable necessity; but also he, who being assaulted in such a manner, and in such a place, that he cannot go back without manifestly endangering his life, kills the other, without retreating at all. And though a person who retreats from an assault to the wall should give the other wounds in his retreat, yet if he give him no mortal wound till he get thither, and then kill him, he is guilty of homicide *se defendendo* only. But if the mortal wound were given first, then it is manslaughter.

Homicide by misadventure, is where a man, in doing a lawful act, without any intent of hurt, unfortunately chances to kill another; as where a labourer being at work with an hatchet, the head thereof flies off, and kills one who stands by. It seems clear, that neither homicide by misadventure, nor homicide *se defendendo*, are felonious, because they are not accompanied with a felonious intent, which is necessary in every felony.

Homicide (Justifiable). To make homicide justifiable, it must be owing to some unavoidable necessity, to which a person who kills another must be reduced, without any manner of fault in himself. And there must be no malice coloured under pretence of necessity; for wherever a person who kills another, acts in truth upon malice, and takes occasion upon the appearance of necessity to execute his own private revenge, he is guilty of murder. But if a woman kill him who assaulteth to ravish her, it is no felony: or if a man come to burn my house, and I go out and kill him, it is no felony. So, "if any evil-disposed person shall attempt feloniously to rob or murder any person in any dwelling house, or highway, or feloniously attempt to break any dwelling-house in the night-time, and shall happen to be slain in such felonious attempt, the slayer shall be discharged and shall forfeit no lands nor goods." 24 Henry VIII. c. 5. Justifiable homicide of a public nature is such as is occasioned by the due execution or advancement of public justice, with regard to which it must be observed, 1. That the judgment, by virtue whereof any person is put to death, must be given by one who has jurisdiction in the cause; for otherwise both judge and officer may be guilty of felony. 2. The execution must be pursuant to and warranted by the judgment, otherwise it is without authority; and consequently, if a sheriff shall behead a man, when it is no part of the sentence to cut off the head, he is guilty of felony.

Homicide, manslaughter, against the life of another, is either with or without malice; that which is without malice is called manslaughter, or sometimes chance medley, or chaud-medley, by which is understood such killing as happens either on a sudden quarrel, or in the commission of an unlawful act, without any deliberate intention of doing any mischief at all. Hence it follows, that there can be no accessaries to this offence before the fact, because it must be done without premeditation; but there may be accessaries after the fact. The only difference between murder and man-

slaughter, is, that murder is upon malice aforethought, and manslaughter upon a sudden occasion, as if two meet together, and striving for the wall, the one kills the other, this is manslaughter and felony. And if they had, on that sudden occasion, gone into the field and fought, and the one had killed the other, this had been but manslaughter, and no murder; because all that followed was but a continuance of the first sudden occasion, and the blood was never cooled till the blow was given.

Chance, or chaud-medley. Authors of the first authority disagree about the application of this word. By some it is applied to homicide by misadventure, by others to manslaughter. The original meaning of the word seems to favour the former opinion, as it signifies a sudden or casual meddling or contention; but homicide by misadventure supposes no previous meddling or falling out.

Murder is the highest crime against the law of nature, that a man is capable of committing. It is when a man of sound memory, and at the age of discretion, unlawfully kills another person under the king's peace with malice aforethought, either expressed by the party, or implied by the law, so as the party wounded or hurt die of the wound or hurt within a year and a day, the whole day on which the hurt was done being reckoned the first.

By malice expressed, is meant a deliberate intention of doing any bodily harm to another, whereunto by law a person is not authorized.

And the evidences of such malice must arise from external circumstances discovering that inward intention; as lying in wait, menacings antecedent, former grudges, deliberate compassings and the like, which are various, according to the variety of circumstances. 1 H. H. 451.

Malice implied, is where a person voluntarily kills another, without any provocation; for in this case the law presumes it to be malicious, and that he is a public enemy of mankind. 1 H. H. 455.

In general any formed design of doing mischief may be called malice; and therefore not such killing only as proceeds from premeditated hatred or revenge against the person killed, but also in many other cases, such as is accompanied with circumstances which shew the heart to be perversely wicked, is judged to be of malice prepense, or aforethought, and consequently murder. 2 Haw. 80.

If a man kills another, it shall be intended prima facie that he did it maliciously, unless he makes the contrary appear, by shewing that he did it on a sudden provocation or the like. 1 Haw. 82.

When the law makes use of the term malice aforethought, as descriptive of the crime of murder, it must not be understood in that narrow restrained sense to which the modern use of the word malice is apt to lead one, a principle of malevolence to particulars; for the law by the term malice, in this instance, means, that the fact has been attended with such circumstances as are the ordinary symptoms of a wicked heart, regardless of social duty, and fatally bent upon mischief. Fost. 256.

The law so far abhors all duelling in cold blood, that not only the principal who actually kills the other, but also his seconds, are guilty of murder, whether they fought or not; and it is holden that the seconds of the person killed are also equally guilty, in respect to that countenance which they give to their principals in the execution of their purpose, by accompanying them therein, and being ready to bear a part with them. I Haw. 82.

Also it seems agreed, that no breach of a man's word or promise, no trespass either to land or goods, no affront by bare words or gestures, however false or malicious it may be, and aggravated with the most provoking circumstances, will excuse him from being guilty of murder who is so far transported thereby, as immediately to attack the person who offends, in such a manner as manifestly endangers his life, without giving him time to put himself upon his guard, if he kills him in pursuance of such assault, whether the person slain did at all fight in his defence or not. Id.

HOMICI'DIAL. *a.* (from *homicide.*) Murderous; bloody (*Pope*).

HOMILE'TICAL. *a.* (ομιλητικος.) Social; conversable (*Atterbury*).

HOMILY, in ecclesiastical writers, a sermon or discourse upon some point of religion, delivered in a plain manner, so as to be easily understood by the common people. The word is Greek, ομιλια; formed of ομιλος, *cœtus*, "assembly or council."

The Greek homily, says M. Fleury, signifies a familiar discourse, like the Latin *sermo*; and discourses delivered in the church took these denominations, to intimate, that they were not harangues or matters of ostentation and flourish, like those of profane orators, but familiar and useful discourses, as of a master to his disciples, or a father to his children.

All the homilies of the Greek and Latin fathers are composed by bishops. We have none of Tertullian, Clemens Alexandrinus, and many other learned persons; because, in the first ages, none but bishops were admitted to preach. The privilege was not ordinarily allowed to priests till toward the fifth century. St. Chrysostom was the first presbyter that preached statedly. Origen and St. Augustine also preached; but it was by a peculiar licence or privilege.

At the time of the Reformation there were several homilies composed and printed, and ordered to be read in such churches as were not provided with a sufficiently learned minister, in order to prevent unsound doctrine being taught in remote country places.

HOMILIES (Clementine), in ecclesiastical history, are nineteen homilies in Greek, published by Cotelerius, with two letters prefixed; one of them written in the name of Peter, the other in the name of Clement, to James bishop

of Jerusalem; in which last letter they are intitled Clement's Epitome of the Preaching and Travels of Peter. According to Le Clerc, these homilies were composed by an Ebionite in the second century; but Montfaucon supposes that they were forged long after the age of St. Athanasius. Dr. Lardner apprehends, that the Clementine homilies were the original or first edition of the Recognitions; and that they are the same with the work censured by Eusebius under the title of Dialogues of Peter and Appion.

HOMINE REPLEVIANDO, a writ to bail a man out of prison, now disused on account of the superior advantage of the habeas corpus.

HOMO. Man. In zoology, the first genus in the class mammalia, order primates; thus generically characterised: fore teeth cutting; upper four parallel; teats two, pectoral.

1. H. sapiens. Diurnal; varying by education and situation. The varieties as follow:

α. Four-footed, mute, hairy. *Wild man.*

β. Copper-coloured, choleric, erect. *American.* Hair black, straight, thick; nostrils wide; face harsh; beard scanty; obstinate, content, free. Paints himself with fine red lines.

γ. Fair, sanguine, brawny. *European.* Hair yellow, brown, flowing; eyes blue; gentle, acute, inventive. Covered with close vestments; governed by laws.

δ. Sooty, melancholy, rigid. *Asiatic.* Hair black, eyes dark; severe, haughty, covetous. Covered with loose garments. Governed by opinions.

ε. Black, phlegmatic, relaxed. *African.* Hair black, frizzled; skin silky; nose flat; lips tumid; crafty, indolent, negligent. Anoints himself with grease. Governed by caprice.

2. H. monstrosus. Varying by climate or art. The varieties of this species as follow:

α. Small, active, timid. *Mountaineer.*

β. Large, indolent. *Patagonian.*

γ. Less fertile. *Hottentot.*

δ. Beardless. *American.*

ε. Head conic. *Chinese.*

ζ. Head flattened. *Canadian.*

Such is the arrangement of Linnéus; which however is somewhat involved and intricate, and perhaps not quite correct. It is, with much reason, doubted whether the *homo ferus*, or wild man, be a genuine variety. A few scattered accounts of wild boys and wild girls, some of them resembling the sheep, others the wolf, dumb, covered with hair, and walking on all fours, are to be met with in different registers and writers attached to the marvellous, but it has been justly observed by Mr. Kerr, that of all these, some may be ascribed to imposture, and others to exaggeration; most generally to idiots (the offspring of the other varieties), who had strayed from their friends or keepers, and only resembled the wolf or the sheep by imitating their sounds.

The arrangement of Gmelin is somewhat more to the purpose, and we therefore subjoin it for a comparison. The genus admitting but one species is divided into the following varieties:

α. H. albus. White man. Formed by the rules of symmetrical elegance and beauty; or at least by what is generally regarded as such. This division includes almost all the inhabitants of Europe; those of Asia, on this side the Oby, the Caspian, Mount Imaus, and the Ganges, as well as the natives of the north of Africa, of Greenland, and the Esquimaux.

β. H. badius. Brown man. Of a yellowish-brown colour; with scanty hair, flat features, and small eyes. This variety includes the whole of the inhabitants of Asia not comprized in the preceding.

γ. H. niger. Black man. Black complexion, frizzly hair, flat nose, and thick lips. The whole of the inhabitants of Africa, excepting those of its more northerly parts.

δ. H. cupreus. Copper-coloured or red man. The complexion of the skin resembles the hue of unburnished copper. All the inhabitants of America, except the Greenlanders and Esquimaux.

ε. H. fusus. Tawny man. Chiefly of a dark blackish-brown colour; having a broad nose, and harsh, coarse, straght hair. The inhabitants of Australasia, Polynesia, and most of the Indian islands.

The zoological description of Linnéus is as follows:

"The body, which seldom reaches six feet in height, is erect and almost naked, having only some scattered distant hairs, except in a few detached spots, and when born, often entirely naked. The head is egg-shaped; the scalp long and covered with hair; the forehead broad, top of the head flat, and hindhead protuberant. The face is naked, having the brow or forehead flattened and quadrangular; the temples are compressed, with peaked angles pointing upwards and backwards towards the hairy scalp. The eye-brows are prominent, and covered with hairs, which shedding outwards, cover each other like tiles; and between the inner extremities of the two eye-brows, there is a smooth shallow furrow or depression, in a line with the nose. The upper eye-lid is moveable, but the lower one hardly moves, and both are planted at their edges with a row of stiff recurved hairs, named eye-lashes. The eye-balls are round, having no suspending muscles as in those of most quadrupeds; the pupil, or opening of the sight, is circular; and the eye has no membrana nictitana. The upper parts of the cheeks are prominent, softish, and coloured with a red blush; their outer parts flattened; the lower parts are hollowed, lax, and expansile. The nose is prominent, and compressed at the sides; its extremity or point is higher than the rest, and blunt; the nostrils are oval, open downwards, with thickened edges, and are hairy on their insides. The upper lip is al-

most perpendicular, and is furrowed on the middle, from the division between the nostrils to the edge of the lip; the under lip is erect, thicker and more prominent than that above; both have a smooth red protuberance, surrounding their mouth at their edges. The chin is prominent, blunt, and gibbous. In males, the face is round; the mouth is covered with hair, called the beard, which first appears about puberty, in patches on the chin. The teeth in both jaws may be distinguished into three orders; the fore teeth are erect, parallel, and wedge-like, of the kind named incisors or cutting teeth; they stand close to each other, and are more equal and rounder than in other animals: the tusks, called in man eye-teeth and corner-teeth, of which there is only one on each side of the fore-teeth in each jaw, are a little longer than the fore-teeth, but much less so than in other animals, and they are placed close to the other teeth: the grinders, of which there are five on each side in both jaws, are blunt, and divided on their upper surface into pointed eminences; but these are not so remarkable as in other animals. The ears are placed on the sides of the head, are of an oblong rounded figure, with a semilunar bend on their anterior edges; they lie flat to the head, are naked, arched at the margin, on their upper and posterior edges, and are thicker and soft at the under extremities.

"The trunk of the body consists of the neck, breast, back, and belly. The neck is roundish, and shorter than the head; its vertebra or chine bones are not, as in most animals, connected by a suspensary ligament; the nape is hollowed; the throat immediately below the chin is hollow at its upper part, and protuberant in the middle a little lower down. The breast is somewhat flattened both before and behind; on the fore part there is a decavity or depression where it joins with the neck; the armpits are hollow and hairy; the pit of the stomach is flat. On the breast are two distant, round, protuberant mamma or dugs, each having a cylindrical, obtuse, wrinkly, projecting nipple, which is surrounded by a darker coloured circle called the areola. The back is flat, having protuberances on each side at the shoulder-blades, with a furrow or depression between them. The abdomen or belly is large and protuberant, with a hollow at the navel; the epigastric regions, or sides of the belly, are protuberant; the groins flattish and hollowed. The pubes is hairy; the pelvis or basin is wider above, and grows narrower below. The male parts are external and loose; the penis cylindrical; the scrotum roundish, lax, and wrinkled, being divided in the middle by a longitudinal ridge or smooth line, which extends along the whole perinæum. The female parts are compressed and protuberant, having labia, nymphæ, clytoris, and hymen, and, in adults, secreting the catamenia. There is no external tail. The limbs consist of arms and hands instead of fore-legs; and of thighs, legs, and feet. The arms are placed at a distance from each other; they are round, and about a foot in length from the joint of the shoulder to the elbow; the fore-arm, or cubit, contains two bones, and is obtusely prominent; the ulna, which forms the principal thickness of the member, is round and somewhat flattened on the inside. The hands are broad, flat, and rounded; convex on the outside or back of the hand, and concave on the inside or palm. Each hand has five fingers, one of which, named the thumb, is shorter and thicker than the rest, and is placed at some distance from them; the others are near each other, and placed parallel, the outer or little finger being the smallest; the second, named index or fore-finger, and the fourth called the ring-finger, are next in length and in size; and the third or middle-finger is the longest; the point of this last, when the arm and hand hang down, reaches to the middle of the thigh. The nails are rounded and oval, being flatly arched or convex upwards, and each has a semilunar whitish mark at the root or lower extremity.

"The lower limbs are placed close together, having brawny muscular haunches and swelling fleshy hips; the knees are obtuse, bend forwards, and have hollow hams behind. The legs, which are nearly of the same length with the thighs, are of a muscular make behind, where they swell out into what is called the calf; they are lean, and free of flesh on the shins or fore-parts, and taper downwards to the ankle, which have hard hemispherical projections on each side, named the ankle-bones or malleola. The heel is thick, prominent, and gibbous, being longer and broader than in other animals, for giving a firm support to the body; it joins immediately with the sole of the foot. The feet are oblong, convex above, and flattened on the soles, which have a transverse hollow about the middle. Each foot has five toes, somewhat bent downwards, and gibbous or swelled underneath at their extremities: they are all placed close together, the inner or great-toe being thicker and somewhat shorter than the rest; the second and third are nearly of equal length; and the fourth and fifth are shorter than the others, the last mentioned or little toe being the shortest and smallest. The toe-nails resemble those on the fingers.

"Thus man differs from other animals in his erect posture and naked skin, having a hairy scalp, being furnished with hair on the eye-brows and eye-lashes; and having, when arrived at puberty, the pubes, breast, armpits, and the chin of the male, covered with hair.

"His brain is larger than that of any other animal, even the most enormous; he is provided with an uvula, and has organs of speech. His face is placed in the same parallel line with his body: he has a projecting compressed nose, and a prominent chin. His feet, in walking, rest on the heel. He has no tail; and lastly the species is distinguished from other animals by some peculiarities of the female constitution which have been noticed already."

In the earlier editions of his system Linnéus arranged the Troglodytes as another variety of the genus Homo; but he afterwards, and certainly with propriety, transferred them to the genus SIMIA, which see: though there have not been wanting of late, nor are wanting even at present, some physiologists who affect to regard this species of the Simia as the common stock from which all the different varieties of man have arisen: or rather who affect to believe that both man and ape descend from the monkey; the tail having been progressively lost from inusitation, or some accidental circumstance in the animal constitution. Lord Monboddo was one of the warmest and most sturdy adherents to this opinion. From its own absurdity, however, it is now daily losing ground, and will probably be soon totally forgotten.

A still farther variety of the genus Homo has been supposed to exist in the white and colourless individuals denominated Albinos; a name first applied by the Portuguese to Moors who were born white, with every other characteristic of the race from which they descended, and who, on account of this hue, were looked upon by the negroes as monsters. In these persons, however, there were other peculiarities besides the hue of their skin; for their hair, wherever it made its appearance, was equally white, the iris of the eye white, and the pupil rose-coloured.

It has since been pretty fully established that this appearance, instead of indicating a distinct variety of the genus, only indicates a morbid habit of a particular kind: and a habit which is by no means confined to the Moors of Africa, or to negroes of any country; for the very same symptoms, so far as they are capable of applying, have since been ascertained to exist in various parts of Europe: two (both boys) by Saussures, in the regions of Chamouni, where he found them exhibited as a public spectacle by their parents, with lips somewhat thick, light hair, and rose-coloured eyes; four (males also) who were inhabitants of Milan; another male described by Maupertuis; another by Helvetius; and several of still later date in our own country, of whom a few have been females.

Now it is a clear proof that the persons thus denominated Albinos do not form a distinct variety of man, since, although they are stated to be occasionally propagated in Guinea, Java, and Panama, from cohabitation of males and females equally affected with this disease, yet that the instances now adduced sprung, in every example, from parents of coloured hair, common complexion, and eyes of an usual appearance; and hence that when Albinos have been propagated, they can only have been propagated as possessing an hereditary disease.

The proximate cause of this disease is obviously a deficiency in the secretion of that *rete mucosum*, or general colouring matter under the cuticle, which varies the complexion, the colour of the hair, and of the eyes; and the absence of which reduces the whole to the same whitish or colourless appearance. Of the *remote* cause, we are totally ignorant to the present moment. The physical strength we usually find impaired; but the mental faculties seem to sustain no injury.

Another observation we have to make is that the disease, be its remote origin what it may, appears to be more common among males than among females. It seems to have been the opinion of Saussures and Barri that it was altogether confined to males, but this is unquestionably a mistake; for several female Albinas or Albinesses, as they have been called, have been publickly exhibited in this metropolis within the course of the last twenty years, and one if not two of them indigenous to the united kingdom.

Some physiologists, indeed, have on this account gone so far as to imagine that the disease is as common among females as among males, but that from the greater modesty of the former, they have more frequently shunned to make public spectacles of themselves. This however is mere opinion, and that not a very plausible opinion; while it is opposed by almost all the few facts we are able to advance upon this curious subject. In proof of this we will venture to select the following statement of a gentleman whose authority is of no small weight, to which we might add several other instances of a similar kind, if we could allow ourselves space. We select the following, however, because the account is accurately drawn up, and because, if we mistake not, it constitutes the latest account of the kind that has yet been presented to the public. It is given in a letter from Dr. T. S. Traill of Liverpool, to Mr. Nicholson, and was published in his Journal of Natural Philosophy for February 7, 1808.

"Robert Edmond and his wife Anne are both natives of Anglesey in North Wales. He has blue eyes and hair almost black; her eyes are blue, and her hair of a light brown. Neither of them have remarkably fair skins. They have been married fourteen years. Their first child, a girl, had blue eyes and brown hair. The second, a boy, (now before me) has the characteristics of an albino: viz. very fair skin, flaxen hair, and rose-coloured eyes. The third and fourth children were twins, and both boys; one of them has blue eyes and dark brown hair; the other was an albino. The former is still alive: the albino lived nine months, though a very puny child. The fifth child, a girl, had blue eyes and brown hair. The sixth, and last now here, is a perfect albino.

"The oldest of these albinoes is now nine years of age, of a delicate constitution, slender, but well formed both in person and in features; his appetite has always been bad: he frequently complains of a dull pain in his forehead; his skin is exceedingly fair; his hair flaxen and soft; his cheeks have very little of the rose in them. The iris and pupil of his eyes are of a bright rose-red colour, reflecting

in some situations an opaline tinge. He cannot endure the strong light of the sun. When desired to look up, his eyelids are in constant motion, and he is incapable of fixing the eye steadily on any object, as is observed in those labouring under some kinds of slight ophthalmia, but in him is unaccompanied by tears. His mother says, that his tears never flow in the coldest weather, but when vexed they are shed abundantly. The white of the eye is generally bloodshot. He says he sees better by candle than by daylight; especially at present, when the reflection from the snow on the ground is extremely offensive to him. He goes to school, but generally retires to the darkest part of it to read his lesson, because this is most agreeable to his eyes. In my room, which has a northern aspect, he can only distinguish some of the letters in the pages of the Edinburgh Review; but, if the light is not permitted to fall full on the book, he is able to read most of them. He holds the book very near his eye. His disposition is very gentle; he is not deficient in intellect. His whole appearance is so remarkable, that some years ago a person attempted to steal him, and would have succeeded in dragging him away, had not his cries brought a person to his assistance.

"The youngest child is now nine months old; is a very stout lively, noisy, and healthy boy. In other respects he perfectly resembles his brother.

"The mother says, that one of her cousins has a very fair skin, flaxen hair, and very weak light blue eyes.

"Professor Blumenbach of Gottingen, in a curious memoir read before the Royal Society of that city, endeavoured to prove, that the red colour of the eyes of the albinoes of Chamouni was owing to the want of pigmentum nigrum within the eye. About the same time, Buzzi of Milan had an opportunity of dissecting an albino, and proved, that the pigmentum nigrum of the choroid coat, and also that portion of it which lies behind the iris, and is called uvea by anatomists, were wanting; thus demonstrating what Blumenbach had supposed. This deficiency was observed before by Blumenbach in some white dogs, owls, and in white rabbits. Buzzi discovered, that the layer of the skin called rete mucosum was also wanting, and to this he with great probability attributes the peculiar fairness of the skin; the colouring matter of the negro, and of the hair of animals, being lodged in this membrane.

"It is well known, that from the tawny natives of Asia, Africa, and America, albinoes sometimes spring, who are said to be capable of propagating a race like themselves, when they intermarry. Whether this be the case with the albinoes of Europe is unknown; for, as far as I have been able to learn, not one of them was a female. There are on record eight instances of European albinoes, beside those now noticed. Two of these are described by Saussure, four by Buzzi, one by Helvetius, and one by Maupertuis, all of whom were males. The parents of the two young men of Chamouni had female children of the usual appearance. The woman of Milan had seven sons, three of whom were albinoes. Mrs. Edmond's girls were all of the usual appearance, but all her boys were albinoes. Among these eleven cases not one albino girl has been found. This at least proves, that males are more subject than females to this singular structure.

"From the perpetuation of this variety of the human species in Java, Guinea, and other places, as well as from the account Mrs. Edmond gives of her cousin, it would seem to be hereditary."

For the anatomical, physiological, natural, moral, civil, and social, histories of man, we must refer to the articles Anatomy, Physiology, Physics, Morals, &c.

HOMODROMUS VECTIS, or Lever, in mechanics, is a lever in which the weight and power are both on the same side of the fulcrum as in the lever of the second and third kind; being so called, because here the weight and power move both in the same direction, whereas in the heterodromus they move in opposite directions.

HOMOGE'NEAL. Homoge'neous. *a.* (ομογενης.) Having the same nature or principles; suitable to each other (*Newton*).

Homogeneal light, is that whose rays are all of one and the same colour, degree of refrangibility, and reflexibility. See Light.

HOMOGE'NEALNESS. Homogene'ity. Homoge'neousness. *s.* Participation of the same principles or nature; similitude of kind (*Cheyne*).

HOMOGENEOUS SURDS, are such whose exponents, or radical signs are the same; as $\sqrt{a}$ and $\sqrt{ab}$, or $2a^{\frac{1}{3}}$ and $3ab^{\frac{1}{3}}$.

HOMOGENEUM ADFECTIONIS, in algebra, that term in an equation which renders it adfected. And *Homogenium comparationis*, the absolute or known number in an adfected equation.

HO'MOGENY. *s.* (ομογενια.) Joint nature not used (*Bacon*).

HOMOLOGATION, in the civil law the act of confirming or rendering a thing more valid and solemn, by publication, repetition, or recognition thereof. The word comes from the Greek ομολογια "consent, assent;" formed of ομος similis, "like," and λογος, of λογειν dicere, "to say;" q. d. to say the same thing, to consent, agree.

HOMO'LOGOUS. *a.* (ομολογος.) Having the same manner or proportions.

Homologous, in geometry, an appellation given to the corresponding sides and angles of similar figures, as being proportional to each other.

All similar figures have their like sides homologous, or proportional to one another; their areas also are homologous, or proportional to the squares of the like sides, and their

solid contents are homologous or proportional to the cubes of the same.

HOMO'NYMOUS. *a.* (ομωνυμος.) Denominating different things; equivocal.

HOMO'NYMY. *s.* (ομωνυμια.) Equivocation; ambiguity.

HOMOPHONOUS, a term in music, applied to such strings or voices as were in unison.

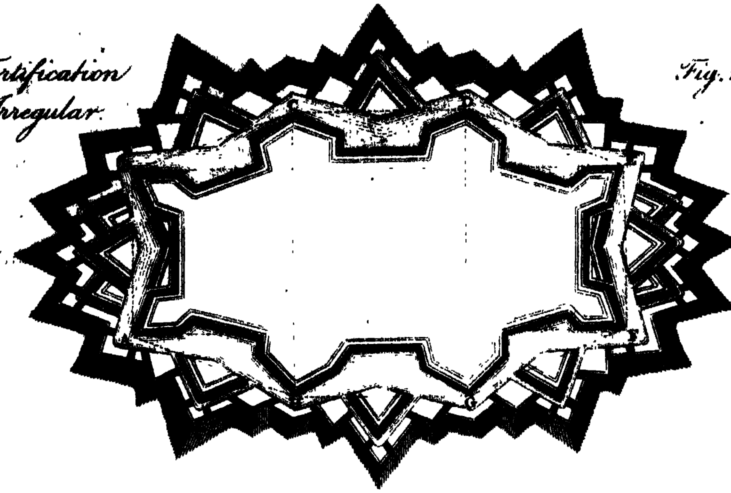
HOMOPLATÆ OS. (*omplata*, ωμοπλατα, from ωμος, the shoulder, and πλατα, the blade). See SCAPULA.

HOMO'TONOUS. *a.* (ομοτονος.) Equable: said of such distempers as keep a constant tenour of rise, state, and declension (*Quincy*).

END OF THE FIFTH VOLUME.

T. DAVISON, Lombard-street,
Whitefriars.

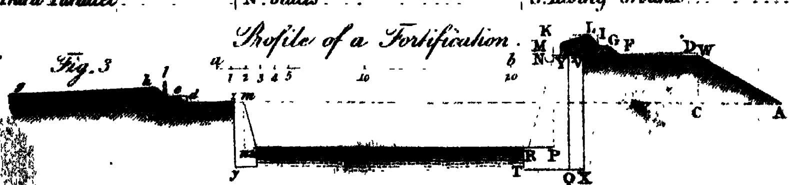
Fortification Irregular. Fig. 1.

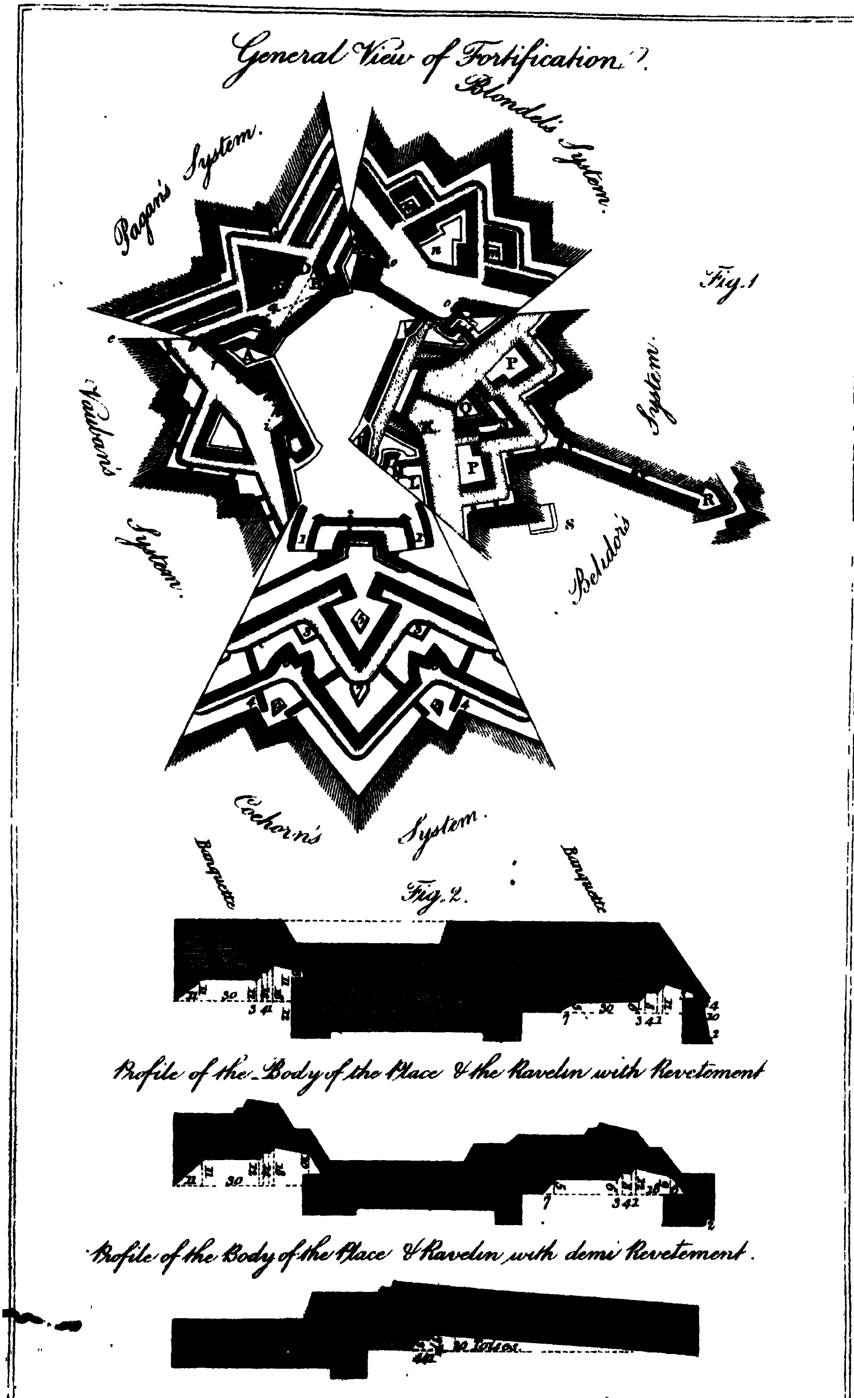


Regular Fortification besieged. Fig. 2.

A.B. *Bastions*	H. *The Approaches*	O. *Places of Arms in the covert way*
C. *Ravelin*	I. *Places of Arms*	P. *The Ditch*
D. *Line of Communication of the Attacks*	K. *Square Redoubts to prevent Sallies*	Q. *Bridge of communication*
E. *First Parallel*	L. *Traverses in the 3.d Parallel*	R. *A River*
F. *Second Parallel*	M. *Batteries* { a. *Cannon* / b. *Mortars*	S. *Rising Ground*
G. *Third Parallel*	N. *Glacis*	

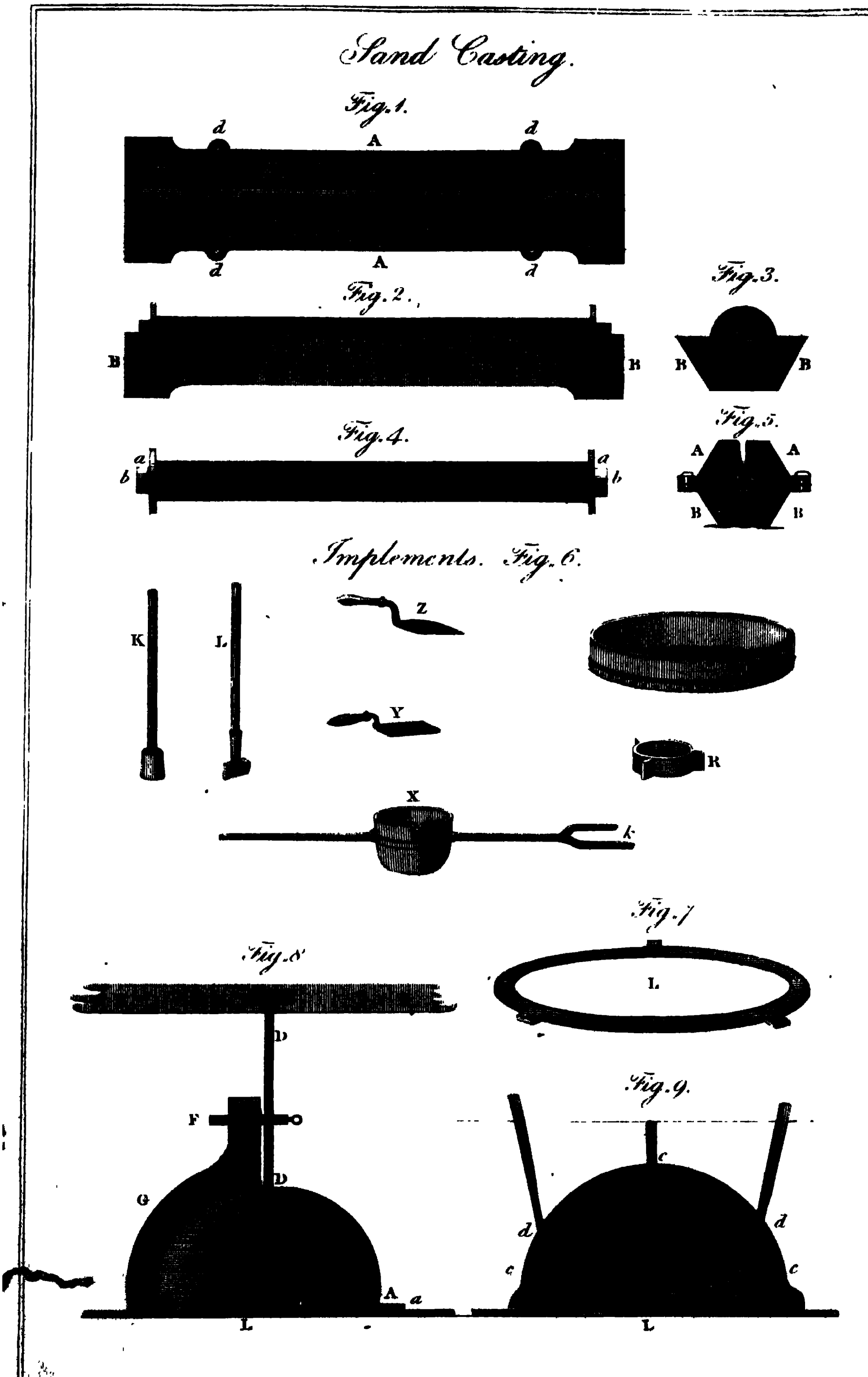
Profile of a Fortification. Fig. 3





Mutlow Sc. Russell Ct.

Published by G. Kearsley, Fleet Street March 1st 1810



J. Farey del. Mutlow sc. Russell Co.

Cupola.

Fig. 1

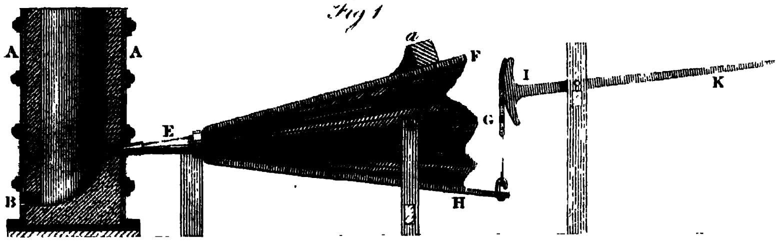
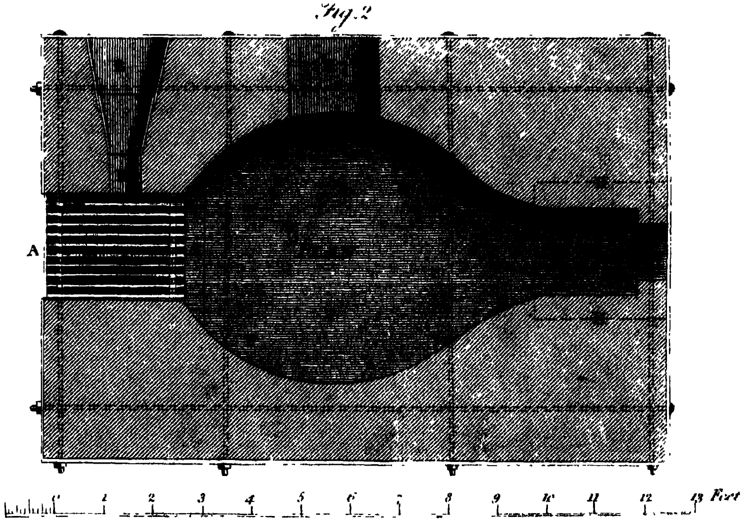


Fig. 2



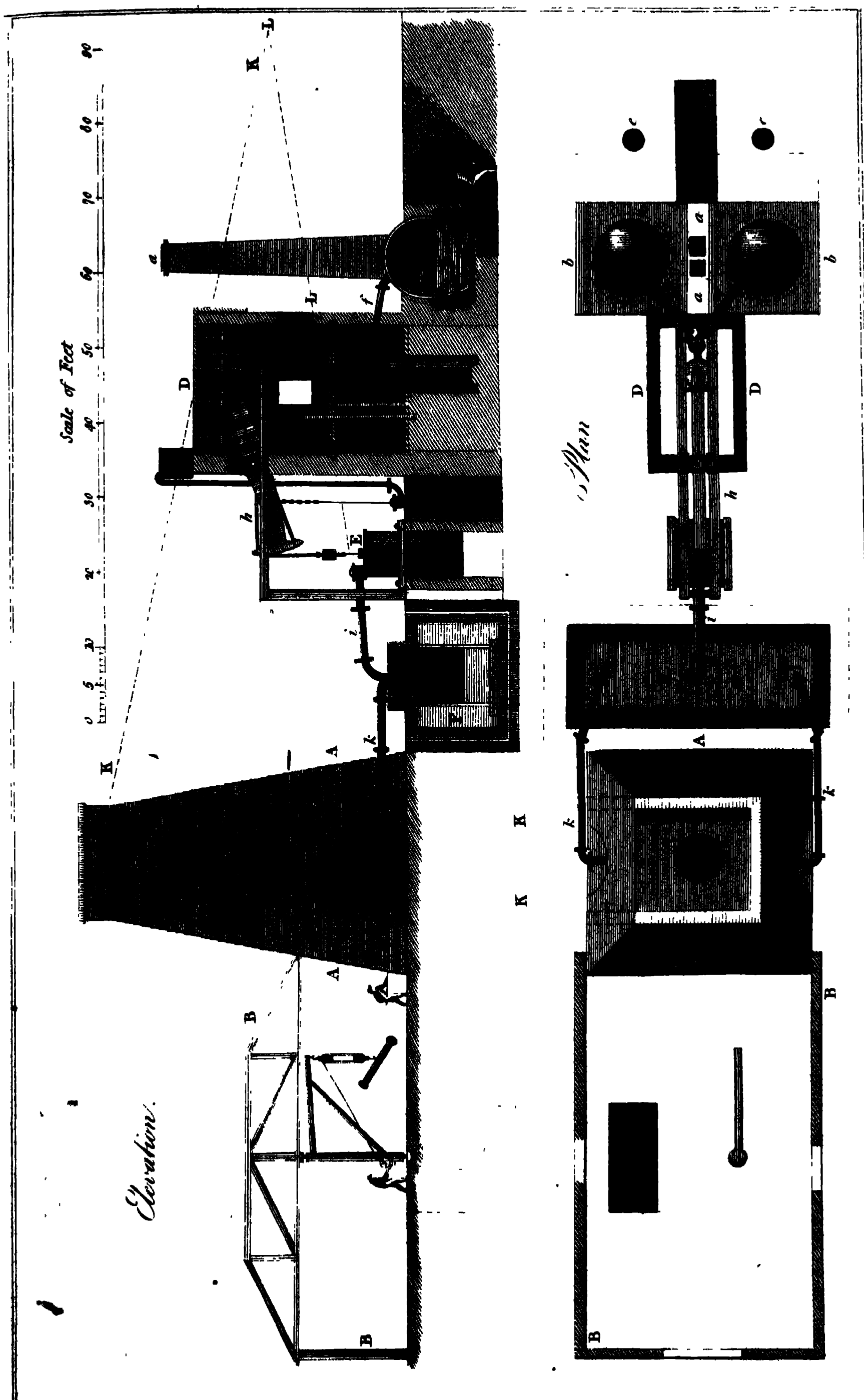
Reverberating Furnace

Fig. 3

J. Farey Junr. del. Mutlow sculp.

Published by G. Kearsley Fleet Street Jan.y 1. 1810

BLAST FURNACE.

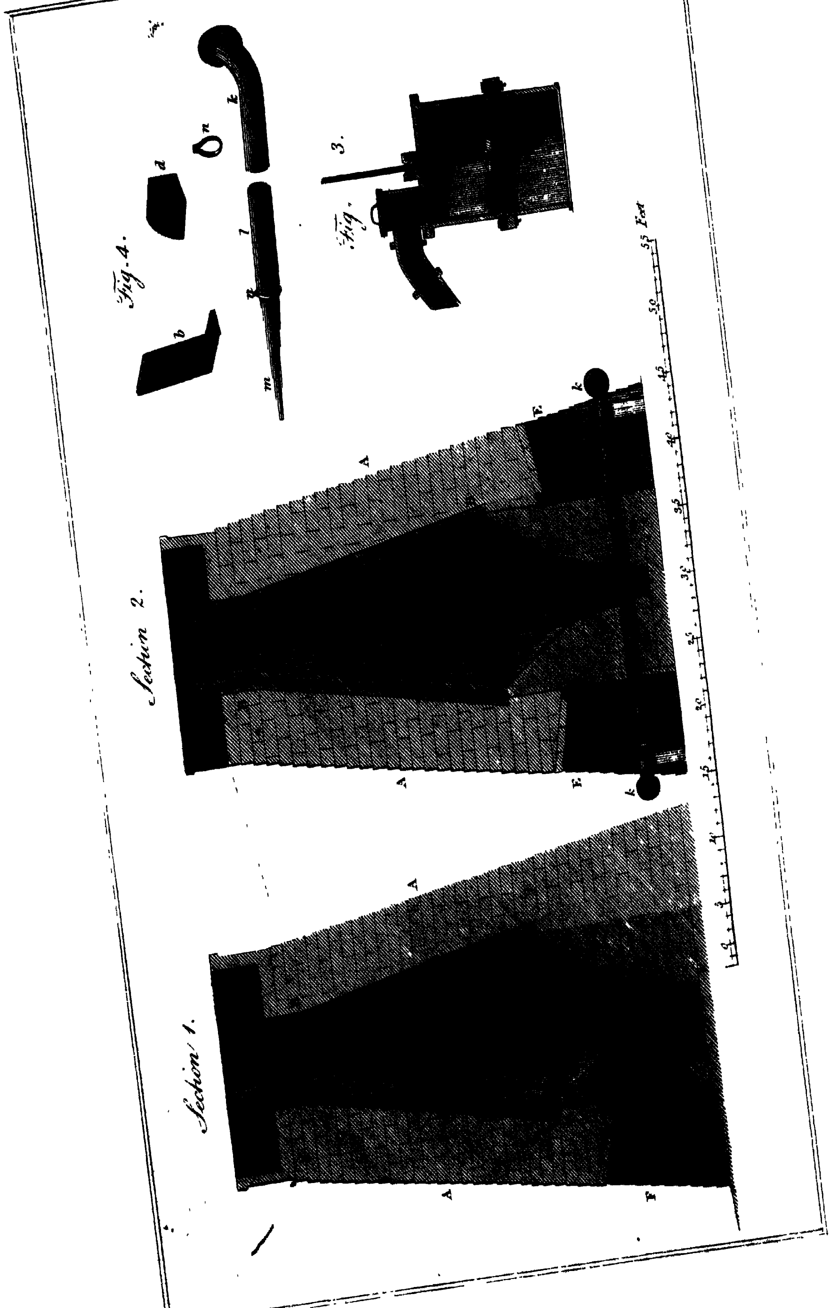


[illegible]

Mutlow sc. Russell Ct.

BLAST FURNACE.

PL. 90.



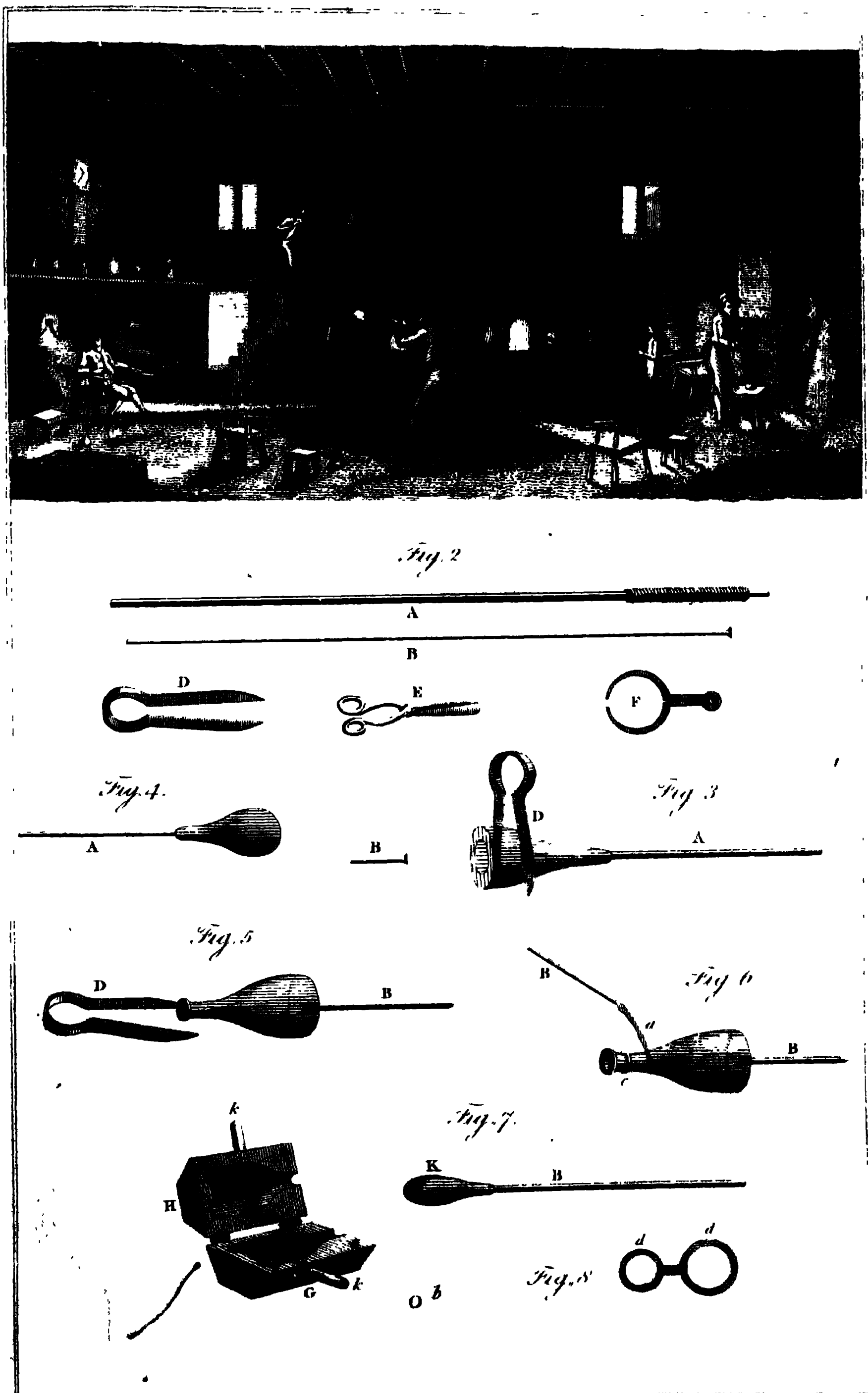
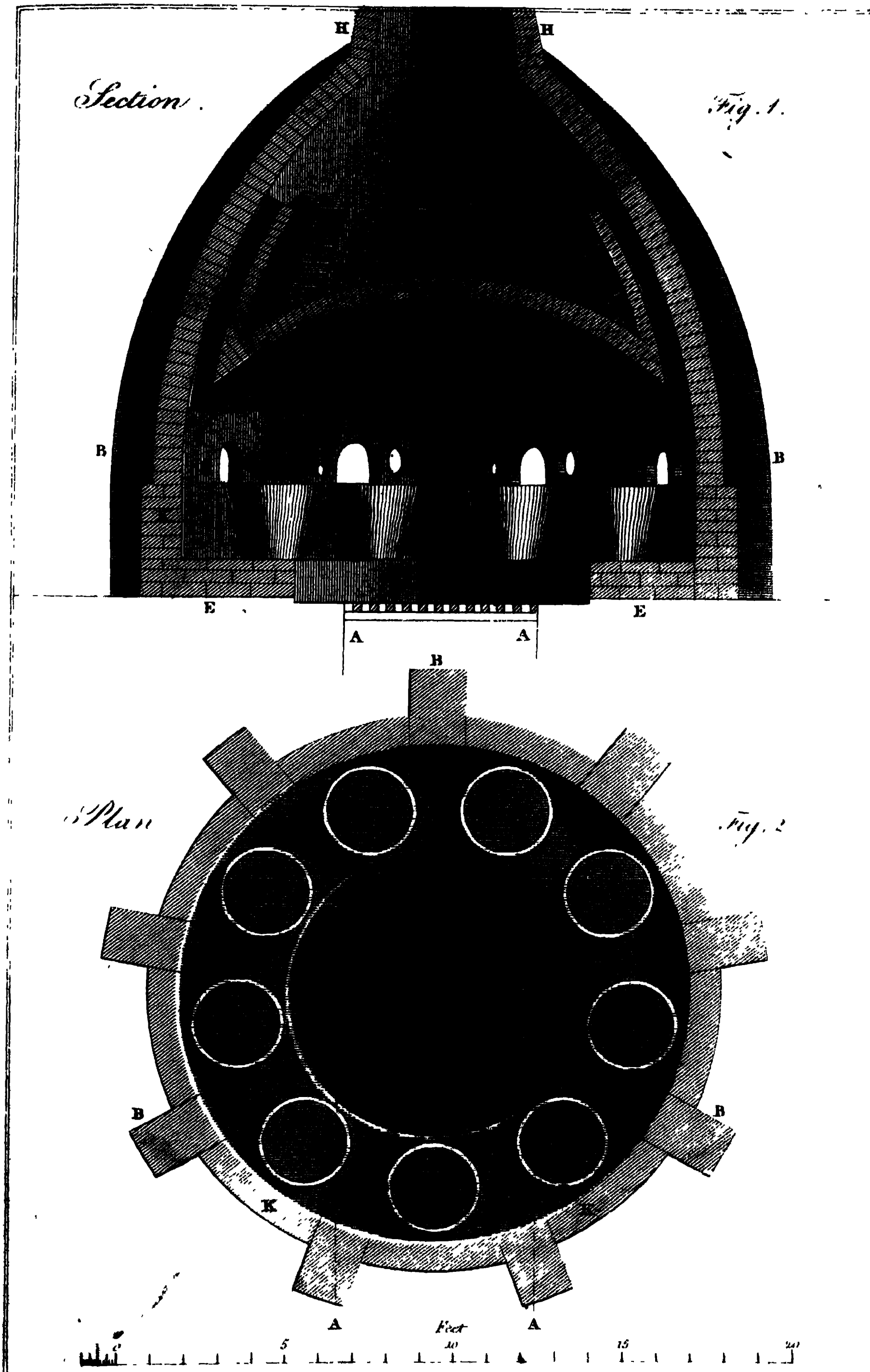


Fig. 2
A
B
D
E
F
Fig. 4.
A
B
Fig. 3
D
A
Fig. 5
D
B
Fig. 6
B
a
B
c
k
H
G
k
b
Fig. 7.
K
B
Fig. 8
d
d

GLASS FURNACE.



J. Farey del.

Mutlow sc. Russell ct

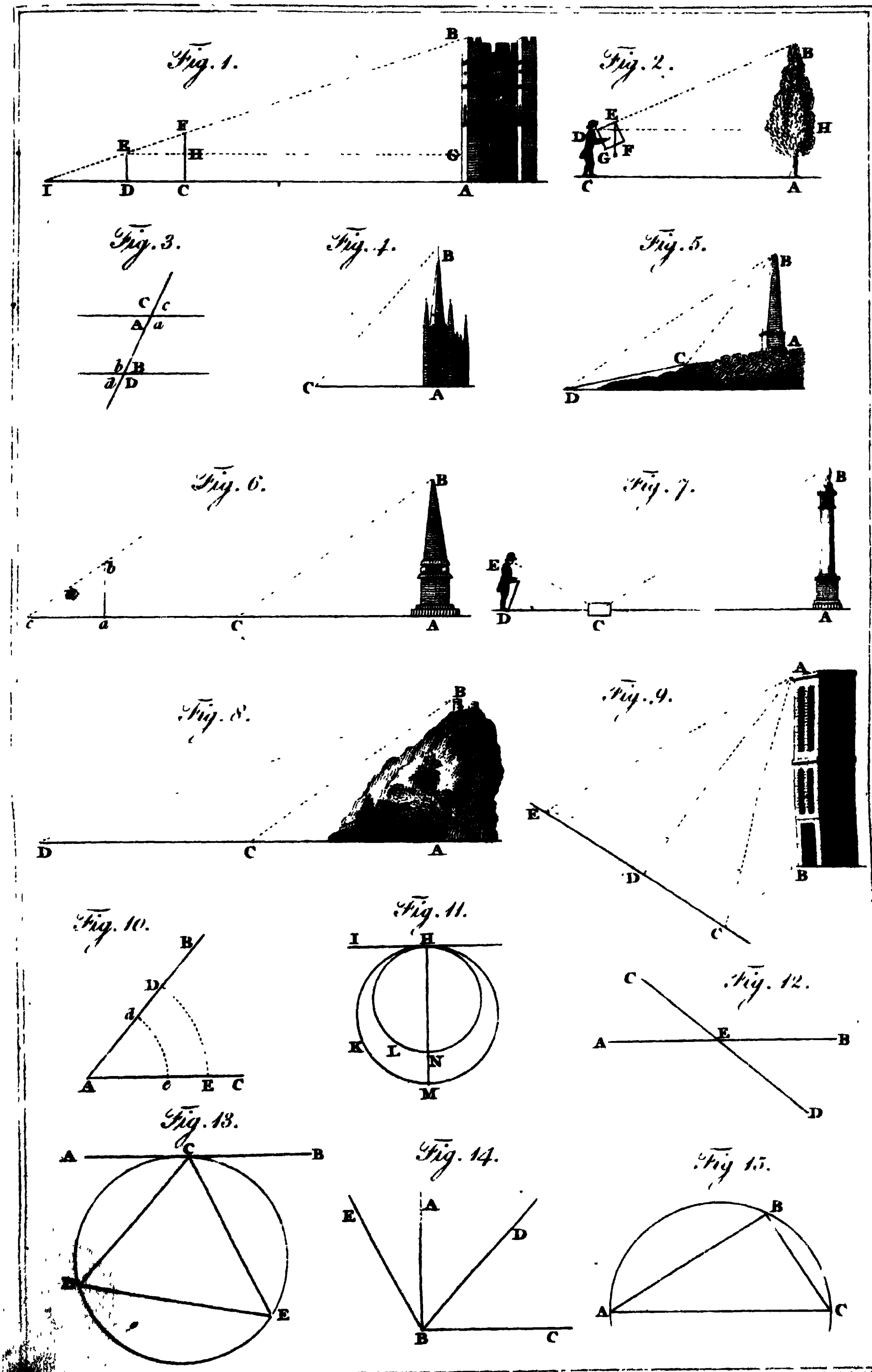
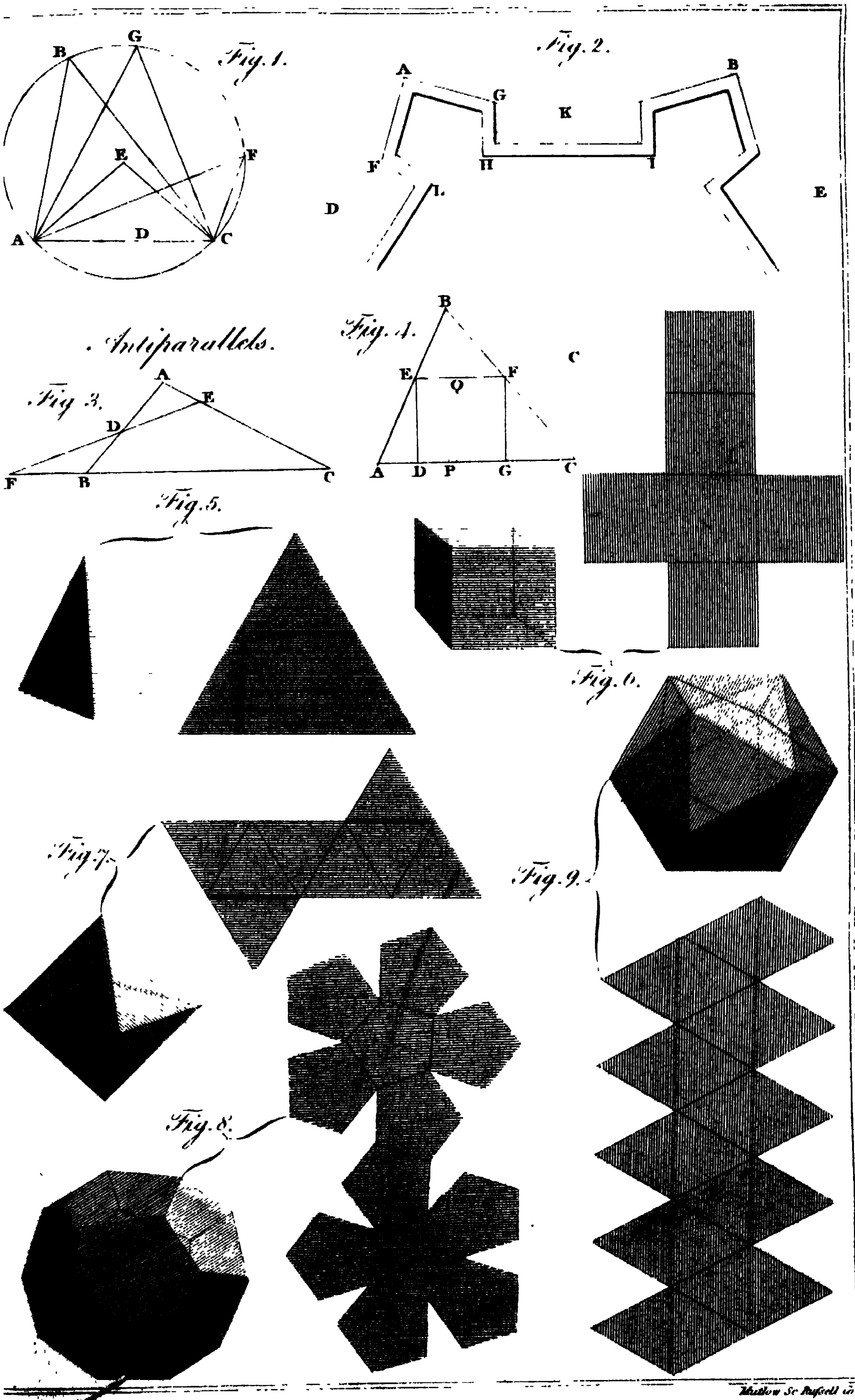


Fig. 1.
B F E H G I D C A
Fig. 2.
B E D H G F C A
Fig. 3.
C c A a b B d D
Fig. 4.
B C A
Fig. 5.
B A C D
Fig. 6.
B b c a C A
Fig. 7.
B E D C A
Fig. 8.
B D C A
Fig. 9.
A E D C B
Fig. 10.
B D d A e E C
Fig. 11.
I H K L N M
Fig. 12.
C A E B D
Fig. 13.
A C B D E
Fig. 14.
E A D B C
Fig. 15.
B A C



Mutlow Sc. Russell del.

Published by G. Kearsley, Fleet Street, Aug. 1st 1805

Fig. 1.

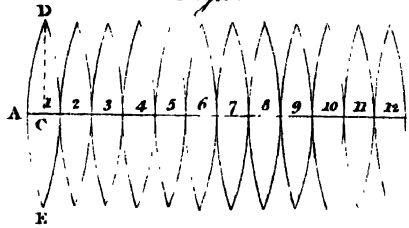


Fig. 2.

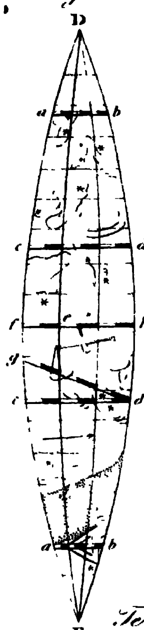


Fig. 3

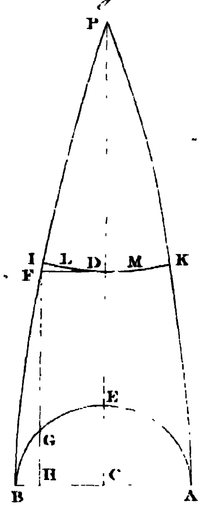
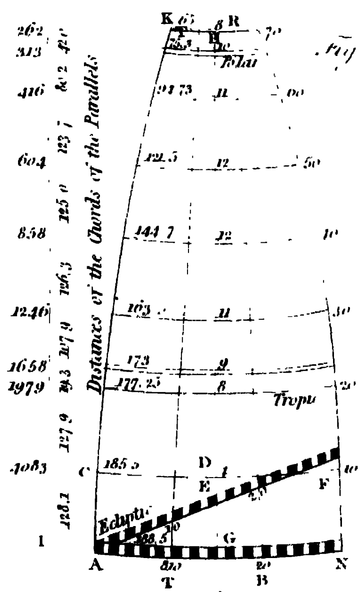
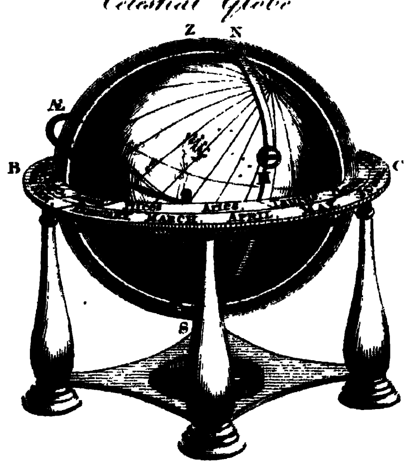


Fig. 4



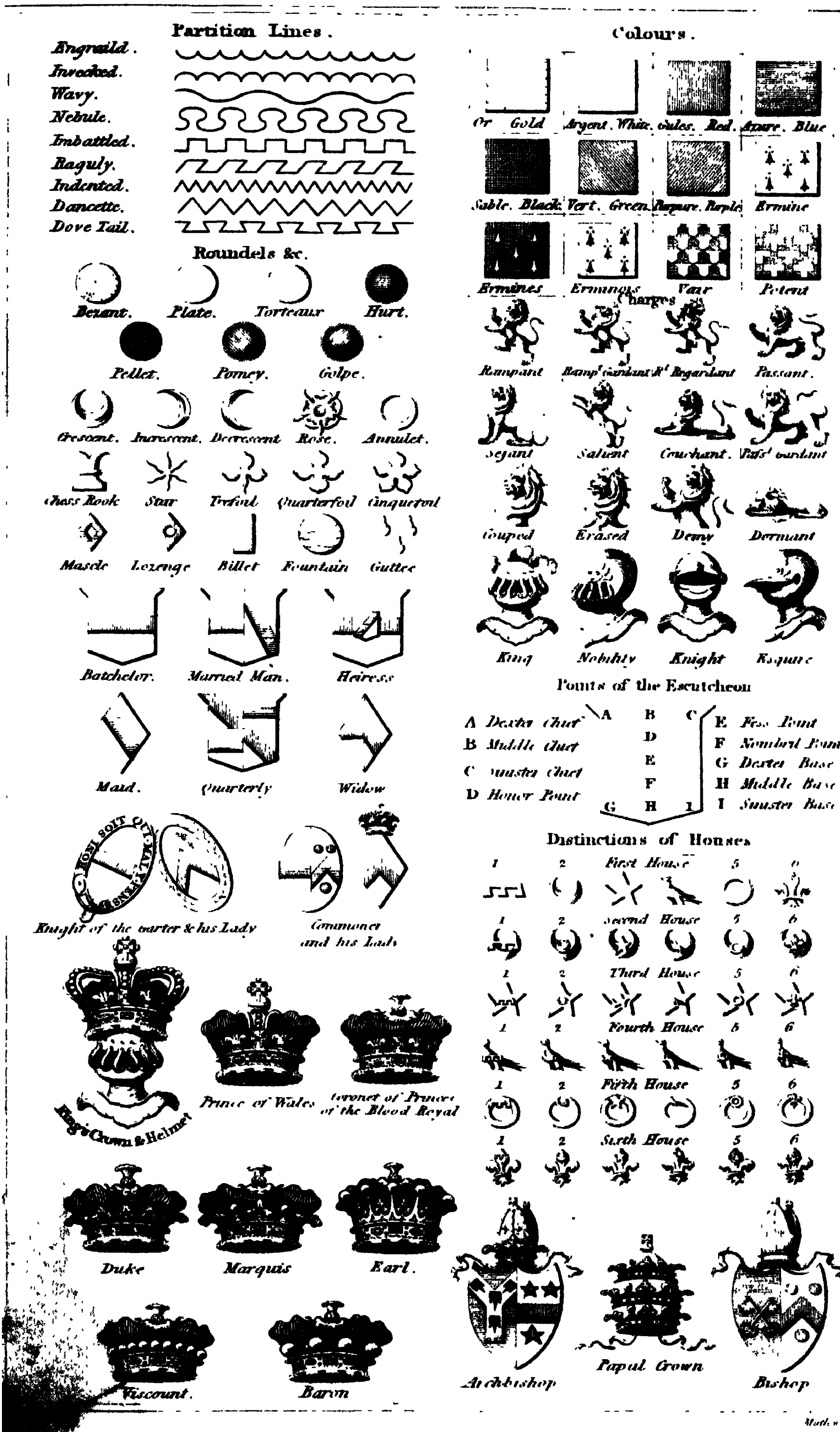
Terrestrial Globe.

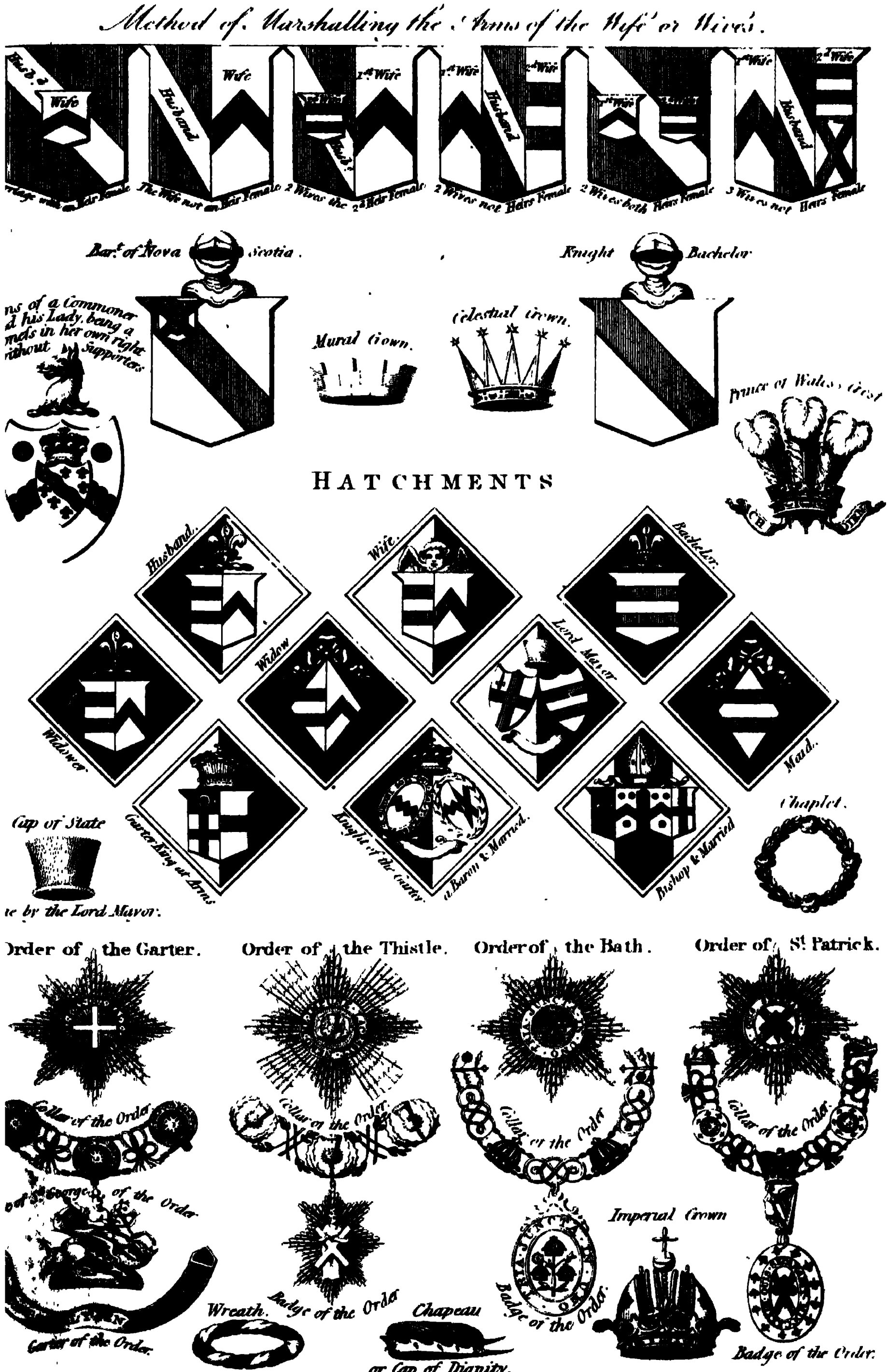
Celestial Globe

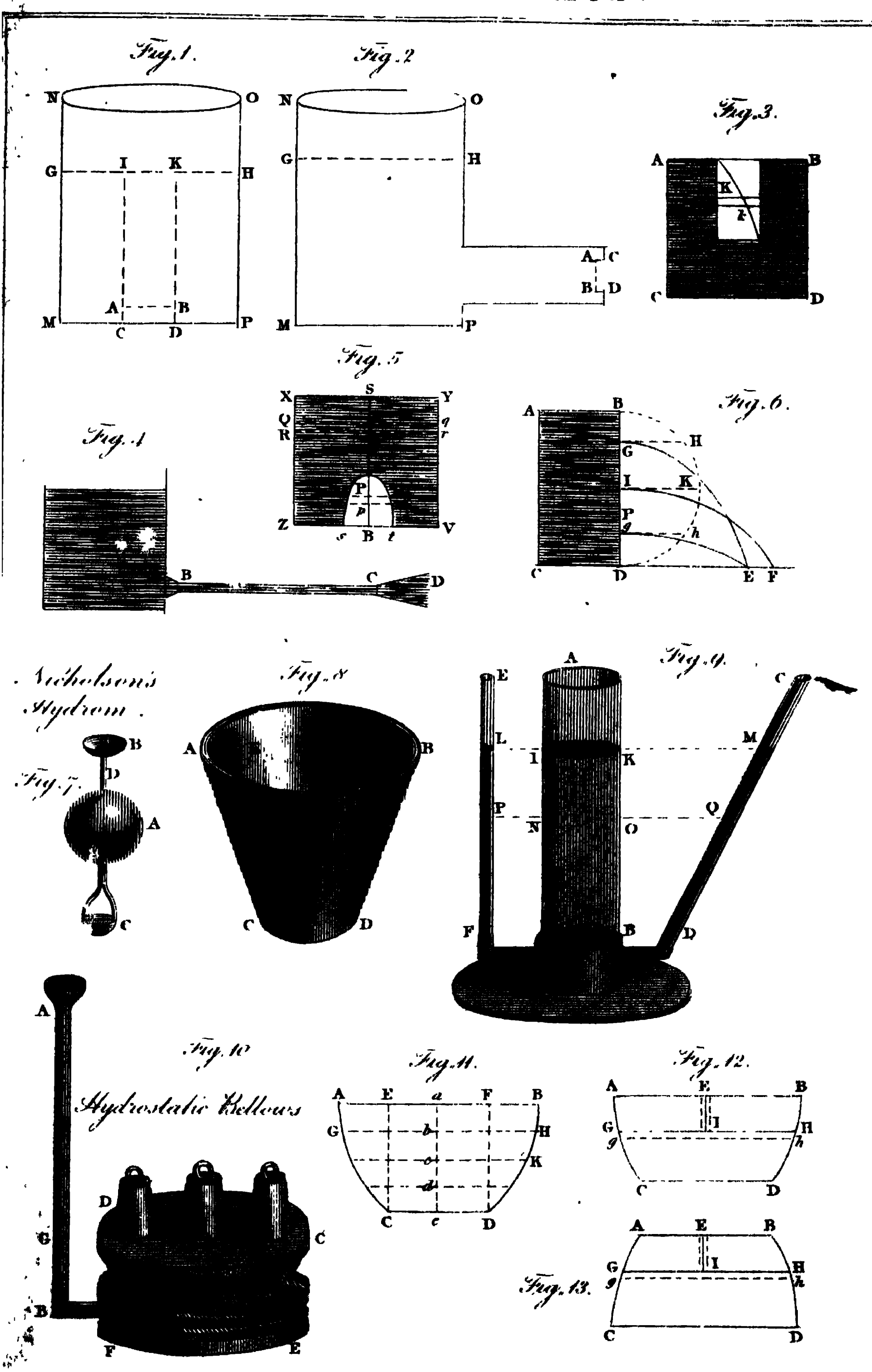


Mutlow & Russell sc.

Published by G. Kearsley Fleet Street April 1st 1810


Partition Lines.
Engrailed.
Invecked.
Wavy.
Nebule.
Imbattled.
Raguly.
Indented.
Dancette.
Dove Tail.
Colours.
Or Gold
Argent. White.
Gules. Red.
Azure. Blue
Sable. Black.
Vert. Green.
Purpure. Purple
Ermine
Ermines
Erminois
Vair
Potent
Charges
Rampant
Passant.
Sejant
Salient
Couchant.
Couped
Erased
Demy
Dormant
King
Nobility
Knight
Esquire
Points of the Escutcheon
A Dexter Chief
B Middle Chief
C Sinister Chief
D Honor Point
E Fess Point
F Nombril Point
G Dexter Base
H Middle Base
I Sinister Base
A
B
C
D
E
F
G
H
I
Distinctions of Houses
First House
Second House
Third House
Fourth House
Fifth House
Sixth House
Roundels &c.
Bezant.
Plate.
Torteaux
Hurt.
Pellet.
Pomey.
Golpe.
Crescent.
Increscent.
Decrescent.
Rose.
Annulet.
Chess Rook
Star
Trefoil
Quarterfoil
Cinquefoil
Mascle
Lozenge
Billet
Fountain
Guttee
Batchelor.
Married Man.
Heiress
Maid.
Quarterly
Widow
Knight of the Garter & his Lady
Commoner and his Lady
King's Crown & Helmet
Prince of Wales
Coronet of Princes of the Blood Royal
Duke
Marquis
Earl.
Viscount.
Baron
Archbishop
Papal Crown
Bishop


Method of Marshalling the Arms of the Wife or Wives.
Wife
Husband
Wife
1st Wife
2nd Wife
The Wife not an Heir Female
2 Wives the 2nd Heir Female
2 Wives not Heirs Female
2 Wives both Heirs Female
3 Wives not Heirs Female
Bart. of Nova Scotia.
Knight Bachelor
Mural Crown.
Celestial Crown.
Prince of Wales's Crest
HATCHMENTS
Husband.
Wife.
Bachelor.
Widow
Lord Mayor
Widower
Maid.
Garter King at Arms
Knight of the Garter
a Baron & Married
Bishop & Married
Cap of State
Chaplet.
Order of the Garter.
Order of the Thistle.
Order of the Bath.
Order of St. Patrick.
Collar of the Order
Collar of the Order
Collar of the Order
Collar of the Order
Imperial Crown
Garter of the Order.
Wreath.
Badge of the Order
Chapeau
or Cap of Dignity.
Badge of the Order
Badge of the Order.



Mutlow sc Russell Co.

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Fig. 1.

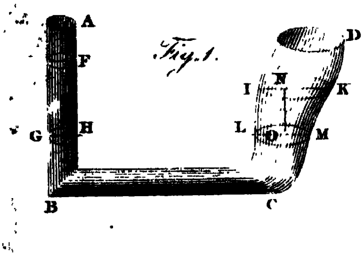


Fig. 2.

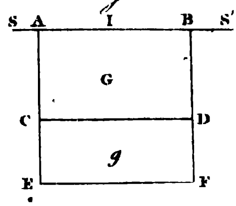


Fig. 3.

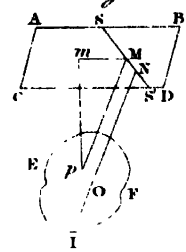


Fig. 4.

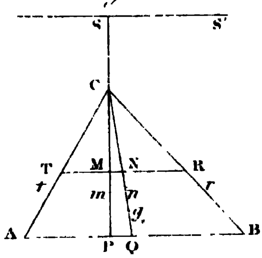


Fig. 5.

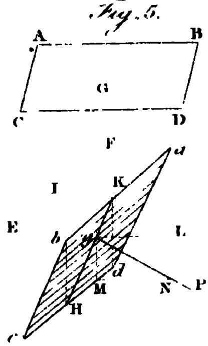


Fig. 6.

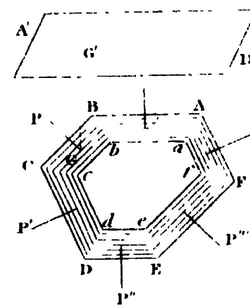


Fig. 7.

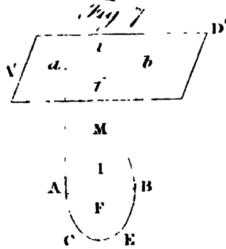


Fig. 8.

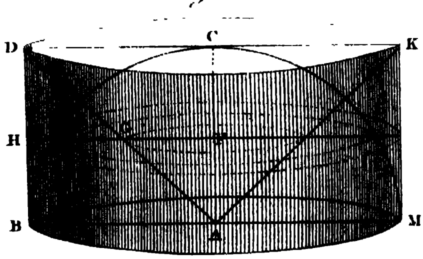
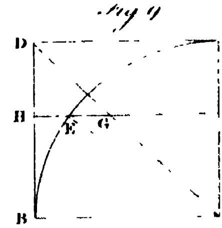
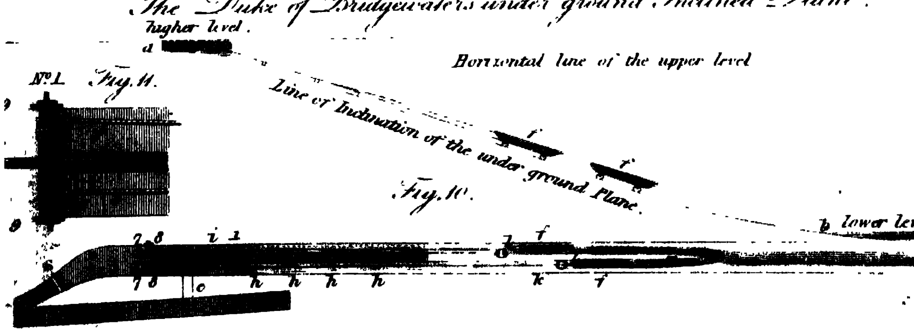


Fig. 9.



The Duke of Bridgewater's under ground Inclined = Plane.



Mutlow Sc. Russel Court

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